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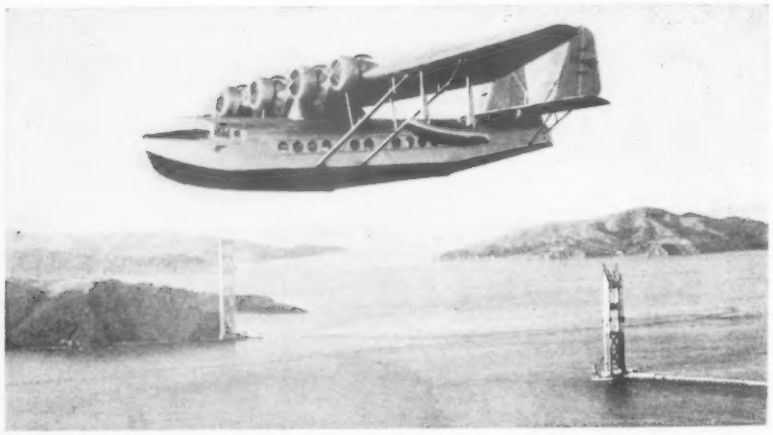
The China Clipper Breathes

by MAX KARANT
Aviation Editor,
Evanston (Ill.) News-Index



The trail-blazing China Clipper passing over the new Golden Gate bridge on its first flight from California to Hawaii. This inaugurates a new era in our relations with the Orient.

CHINA CLIPPER . . .

Behind that adventurous name lie centuries of exploration, romance, success, failure—and death. The first China Clipper probably sailed the mysterious seas of the Far East hundreds of years ago plying its hazardous way from one outpost of civilization to another.

Early American maritime history bears many records, some splotched with stains of piracy, greed—and death—of proud and mighty clipper ships. These romantic sailing vessels opened many a new trail to other sections of the world. The early traders of the Old World found much profit in trading with New World merchants and found the slow but more or less reliable clipper ships to be their sole means of carrying on commerce. Yet, it was thus that those pioneers made transportation history.

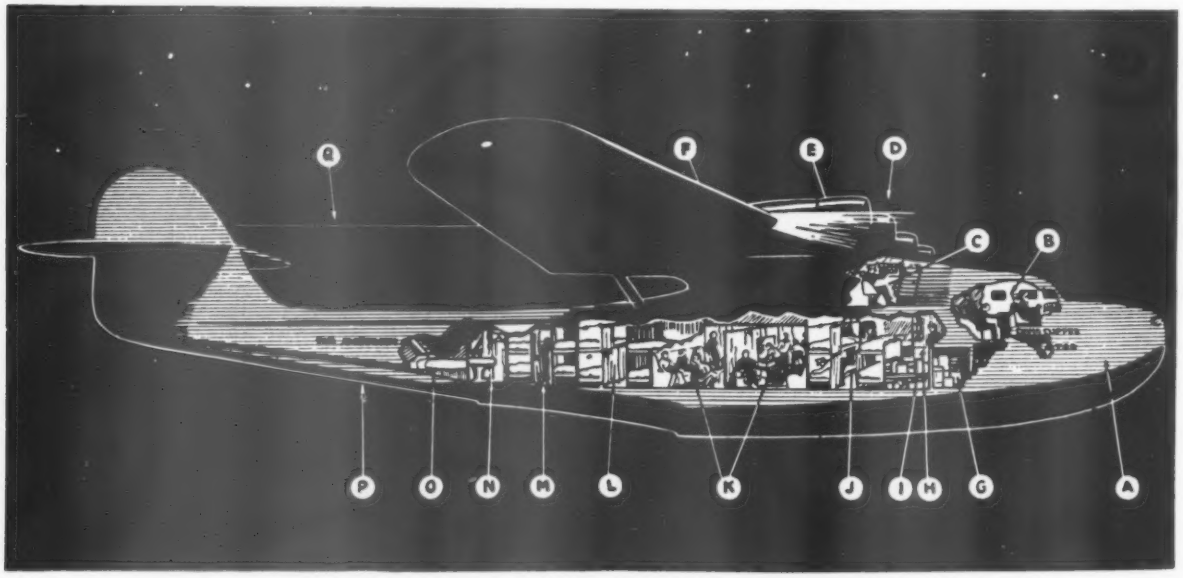
Death always had taken a major toll of lives in those early bravings of the seas. Death always hovered over the wind-tossed clippers. If the unchartered storm-tossed seas didn't blow a clipper on some unknown speck of land, there always was the threat of pirates—or mutiny. But always death in some form.

Traditional danger of the clipper ships suffered a terrific jolt, recently, when Pan American Airways entered the ocean-going trade. The modern luxury liners with which steamship companies had equipped their lines had, of course, eliminated much of the romance and danger connected with a Pacific crossing, but never had a system by which the earth's greatest body of water could be crossed with almost boring safety been known that even remotely approaches Pan American's flying clipper line.

Although inexperience and fear always played a leading role in the drama of the clipper ships, it remained for Pan American to add the newest and most astonishing chapter in the history of trade, commerce and aviation—the aerial China Clipper and its sister ships.

Four jam-packed years of exhaustive research; four years in which the far-sighted president of Pan American, Juan T. Trippe, plotted and planned the most fantastic airline and flying equipment yet heard of. Even Andre Priester, Pan American's old-time air-wise chief engineer, was taken aback by the scope of Trippe's plans.

Many an American aircraft manufacturer, scenting a juicy contract (Pan American is a top ranking customer to any aeronautical manufacturer) flocked to the company's Manhattan offices. All but two of them left there wide-eyed, believing they had been listening to madmen hiding behind Pan American's winged globe insignia. But it was the two manufacturers who remained behind

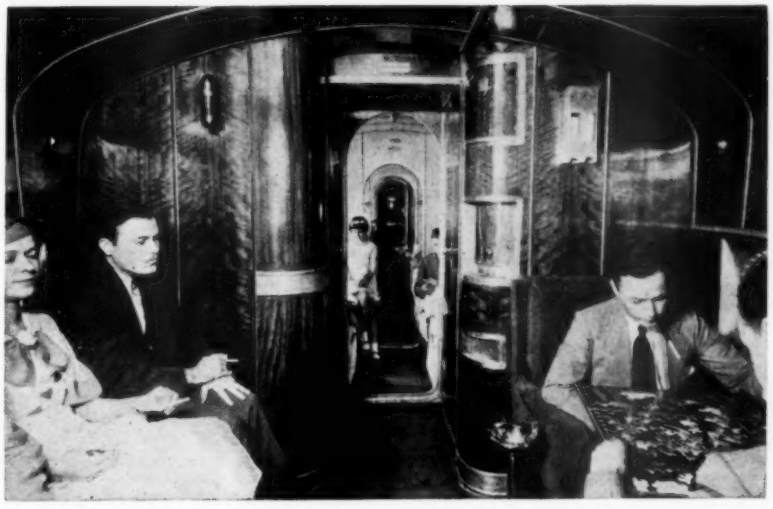


The China Clipper made up for night flying, with berths down and passengers redistributed. See drawing on opposite page for identification of letters.

Romance of the Old Traders

THE modern combination of mechanical and electrical miracles, the airplane, radio communication and navigational instruments has just achieved an epoch in modern travel.

The marvelous flight of the China Clipper over the proposed trans-pacific route between the United States and the Orient is the most stupendous undertaking in aviation. To hurl a 51,000 pound missile through the air, from California to Hawaii is breath-taking.



This is the interior of the "China Clipper" in the service of Pan American Airways. As will be seen, the interior is beautifully finished and well arranged. The sound-proof cabin is provided with comfortable chairs and divans which are turned into berths at night.

to hear the rest of the proposed aerial ocean liners' specifications that since have made history.

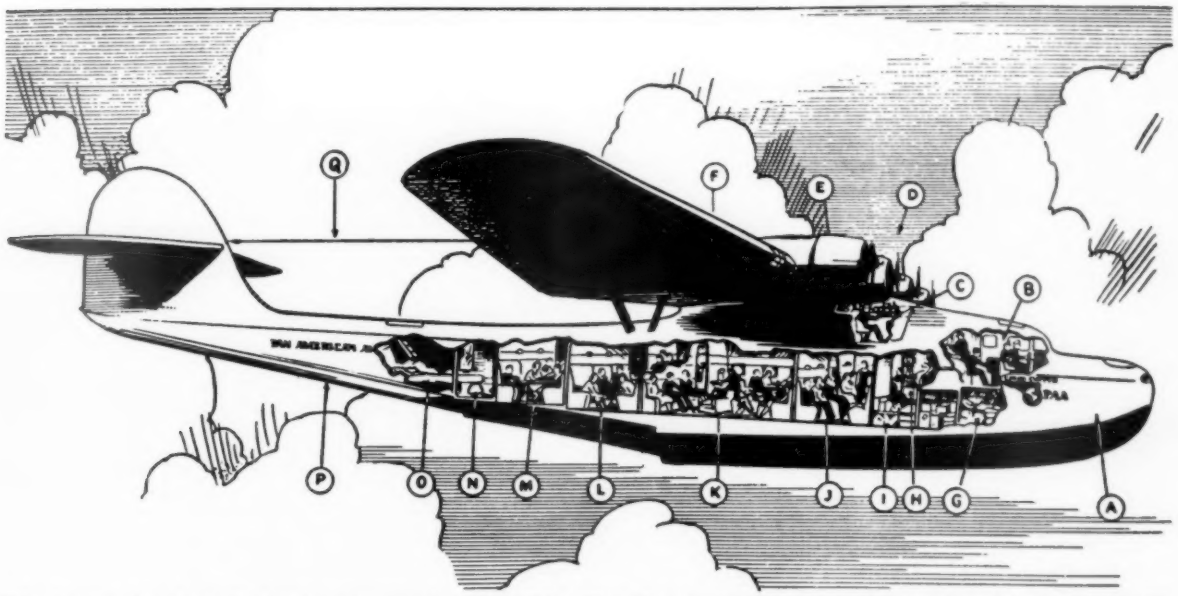
From these plans Igor Sikorsky built his famous four-engined flying-boat which Pan American promptly named after the early Pacific clippers—Pan American Clipper. Glenn Luther Martin, meanwhile, was quietly at work on the most phenomenal airliner know to aviation.

Juan Trippe had long been thinking of his famed international airline in even bigger terms than just the circumventing of South American and the West Indies. Although comparatively little publicity ever has been given the fact, President Trippe was determined to open a trans-Atlantic air line long before Colonel Lindbergh swung his interest to the Pacific and the Orient.

A trans-Atlantic airline would be an easy thing to start if—if foreign countries, whose commercial aviation industries are at least five years behind America's, were broad-minded and far-sighted enough to permit it. If, instead of throwing their resources against such an attempt, these airlines cooperated with Pan American and helped establish what easily could be an invaluable round-the-world airline system.

However, this was far from the minds of certain nations who backed up their commercial aviation interests. Attempting to lay preliminary plans for an airline from the United States to Europe, Pan American officials met one heart-breaking barrier after another.

First, it was (and still is) practically impossible to get permission to land American aircraft regularly on foreign waters. Vital trans-oceanic mail contracts it seems, even today, are non-



This phantom view shows the interior arrangements of the "China Clipper" as arranged for daylight operations. (A) The anchor compartment, containing all of the sea-surface gear. (B) The bridge where all of the flight control and navigational instruments are located. This is the station of the captain-pilot, First-Officer pilot, navigation officer, radio officer. (C) Engine-room, the station of the engineering officer who controls the engines, fuel, propellers and mechanical auxiliaries. (D) Constant speed propellers with brakes. (E) Four double-geared supercharged 800-h.p. wasp engines. (F) The wing span is 130 feet. (G) Cargo compartment for express and mail. (H) Buffet. (I) Luggage compartment. (J) Passenger compartment with berths for six. (M) Passenger compartment with berths for six. (N) Lavatories. (O) Sleeping quarters for two members of the crew, off duty. (P) Aft storage compartment.

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existent. Yet, Germany finds it possible to successfully operate a Zeppelin airline between Europe and South America as does the German Deutsche Luft Hansa which regularly sends flying boats over the route. France finds little difficulty in obtaining permission to operate their airline across the south Atlantic.

Faced with these diplomatic knifings, Juan Trippe saw the "writing on the wall." What he craved was some way to show his line and the United States aviation industry to the pretty backward, close-fisted "foreigners." So, to get his revenge, President Trippe hopefully turned to the Pacific.

There came the day when three ambitious men sat poring over a detailed map in their office high in the New York skyscraper. Trippe was one, Lindbergh another and Chief Engineer Priester the third. They were enthusiastically seeking out every iota of information they could about three tiny almost insignificant islands far out in the Pacific. These islands, Midway, Wake and Guam, were blazing stars on Pan American's horizon, for each of them were marked as possessions of the United States of America.

Too, on the end of the route between these isolated islands lay another American possession—Hawaii.

Pan American's 37-year-old president smiled grimly. Here was the answer to European snubs. There would be few politics connected with landing Pan American—or any American aircraft at these places. And the crowning hope, China, was decidedly favorable toward American aviation. In fact, the long established China National Airways was a Pan American subsidiary!

It was by a sudden decision, after carefully going over the proposed trans-Pacific route that President Trippe called in the aircraft manufacturers. They had one major problem to overcome and it was entirely up to the airplane designers and builders to do it. The longest non-stop jump on the route was between the United States and Honolulu—2,400 miles. Whatever flying boat was built for the new line would have to have at least a 3,000-mile cruising range. The manufacturers gasped.

The "China Clipper" being refueled while on her way to San Francisco.

Martin and Sikorsky thought hard, however. Sikorsky had, some time before, boasted that he could build a 100-passenger flying boat if and when he got the money. Martin was an old hand at building big flying-boats and seaplanes for the navy. Shortly, both men accepted the list of specifications that had been drawn up by Trippe and Priester and set out to satisfy the almost fantastic demands of the Pan Am. Unheard of range. Almost 50 passengers. Enormous payload. Up-to-date performance. Could it be done?

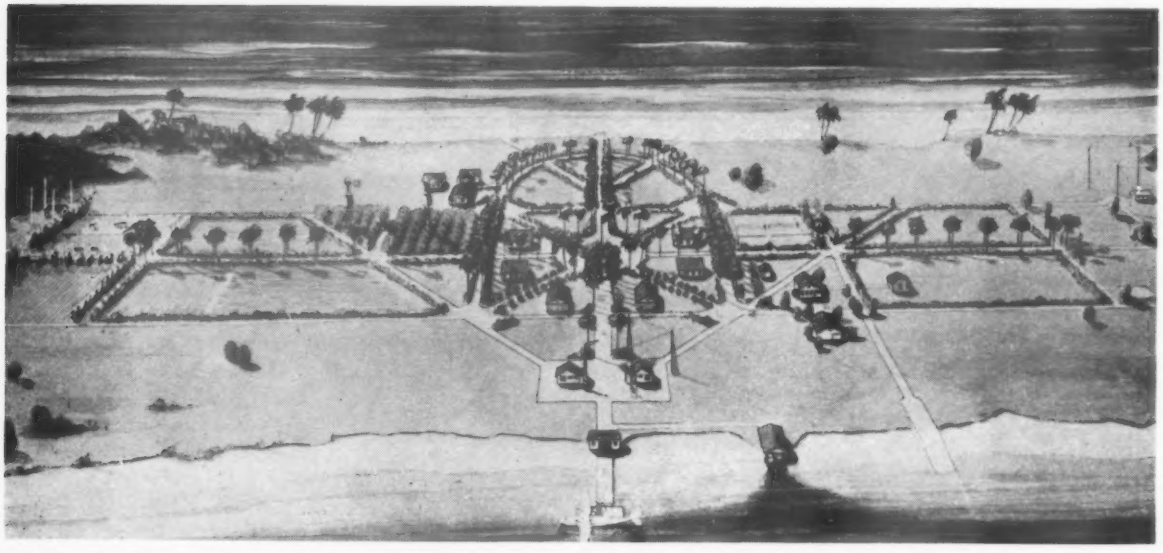
To build such aircraft demanded an amazing amount of foresight and confidence. Martin and Sikorsky have, in their many years of manufacturing, stored up much invaluable knowledge that has been responsible for their established success in the aviation industry. So, both builders set out to build their huge trans-oceanic liners.

How successful these men have been already has been told in print innumerable times during the past few months. Sikorsky, slated by his first delivery on one of the new aerial clippers, delivered to Pan American officials a four-engined flying boat that merely had to take off on a normal flight to smash a long string of world aeronautical records. It was the ship—the Pan American Clipper—that served as the first flying laboratory on the trans-Pacific route which, meanwhile, had been laid out and permanently established by a chartered freight steamer, the S. S. North Haven.

As the last base was being established at Guam and the North Haven was on her way back to the United States, the Pan American Clipper took off from San Francisco bay for the first flight over the Pacific. How successful this and the successive experimental flights of the Pan American Clipper have been also is common knowledge.

Not only do the new trans-Pacific clippers boast of being the most advanced flying machines in aeronautical history; they are also equipped with perfected equipment (instruments, radio, etc.), that

(*Concluded on page* 144)



Here is an architect's drawing of the airport that will be constructed on Midway Island, away out in the Pacific, half way between the United States and China. The first stop, on leaving San Francisco, will be Hawaii, then Midway Island, then Wake Island, then Guam, and then Manila.

The Heroic 1st Aero Squadron

by CARL B. OGILVIE

This true and authentic story of the valorous 1st Aero Squadron, A.E.F., holds a thrill for everyone reading it. It tells of the remarkable achievements, rendered by this unit in supplying headquarters with the necessary photos and information along a wide and active front during the World War.

AT CHATEAU THIERRY, the American Air Service came into its own. On July 2, 1918, a 9-plane American Squadron, making its first squadron flight over the lines, was pounced upon by a flight of 13 war-seasoned enemy pilots.

Instead of hi-tailing away, the outnumbered Americans gave battle. They fought one of the longest massed dog-fights of the Word War. The Americans, shooting down one enemy plane after the other, fought with such skill and daring that it was 35 minutes before the amazed, battle-scarred Boches could manage to withdraw.

Six Boches were shot down. Every man Jack of the nine intrepid Americans returned safely. That was the first squadron battle of the American Air Service!

The 1st Aero Squadron saw action along the Front at the Toul sector, Chateau Thierry, St. Mihiel, and the first and second Argonne-Meuse offensives. It was an observation squadron. The tasks assigned it by the 1st Army was Corps Observation—early morning and late afternoon reconnaissance patrols, artillery regulating and photographic missions.

Its job was to get desired military intelligence and deliver it to Corps HQ.

Lieut. (now major) **Roy C. Kirtland, one of the first pair to use a machine-gun in an airplane, and later, a famous organizer in the U. S. Army. He was in the service, even before the old Jenny days.**

Capt. Townsend F. Dodd who saw service in the Mexican Punitive Expedition, with General Foulois before the squadron entered the World War.

It wasn't supposed to be a fighting outfit. But the 1st Aero Squadron pilots and observers proved themselves men of outstanding ability and red-blooded American fighters.

Seven winged warriors of this first ranking observation outfit were awarded the Distinguished Service Cross. They were: William P. Erwin, Arthur E. Easterbrook, Byrne V. Baucom, Ralph E. DeCastro, Arthur W. Duckstein, John H. Michener and James M. Richardson. The first named were the squadron's Aces and won an oak leaf cluster to wear on the gay, gallant ribbons of their medals.

During its operations at the Front, from April to Nov. 11th, the 1st Aero Squadron engaged in 94 combats, shot down 14 enemy planes, officially verified, and many more too far behind the German lines to be seen. It suffered heavy casualties, losing 26 men consisting of 15 killed, 8 wounded, 6 taken prisoners and 1 missing.

The oldest squadron in the American Air Service saw service before America entered the World War. It was organized in the "Jenny Era," July 1st, 1915. Brigadier-General Benjamin D. Foulois was then the 1st Aero Squadron's commanding officer, with the rank of Captain. The squadron moved to Fort Sill, Oklahoma, the end of the month.

On Aug. 12th, 1915, the squadron suffered its first casualties when Captain Knox and Lieutenant Sutton fell from an altitude of 1,000 feet, during a routine practice flight, and Knox was killed. Nov. 19th, 1915, the squadron moved to Fort Sam Houston, Texas.

Things were happening along the Rio Grande. The American troops were in Mexico searching for the notorious bandit Villa. On March 13th, 1916, orders were received to report to General Pershing at Casas Grandes, Mexico, for immediate service.

The personnel of the aero squadron consisted of Captains Foulois and Townsend F. Dodd, and Lieutenants C. G. Chapman, H. A. Dargue, E. H. Willis, E. S. Gorrell, I. A. Rader, J. E. Carberry, T. S. Bowen, W. G. Killner, and A. R. Christie. Eighty-two enlisted men completed the organization with one civilian mechanic and two Medical Corps men attached. The equipment consisted of 8 airplanes, 10 trucks and an automobile.

Arriving at Columbus, N. M., two days later, work was started immediately assembling its famous Curtiss J.N.-4's. On March 16th, the first reconnaissance flight into Mexico was made when Captain Dodd piloted Captain Foulois, as observer, over the Rio Grande into Mexico.

Striking are the details of the squadron's first "massed" flight, fraught with

Lieut. (now major) **H. H. Arnold, another of the early birds of the U. S. Army Air Service. He subsequently became an important figure in the World War organization.**

motor trouble, forced landings and crack-ups. The eight planes took off at 5:10 P. M. for Casas Grandes. One pilot had motor trouble and was forced to return to Columbus. Four landed at Las Ascencion, Mexico, on account of darkness, and three others, unable to keep formation, landed at as many different places.

One got down out of the dusk safely at Ojo Caliente and thought himself lucky that it took only two days to repair his ship; the second got down at Jamos intact, but the third scared the natives half to death as his life hung in the balance of a crack-up landing near Pearson. His plane couldn't be repaired, so he proceeded to Casas Grandes in the good old infantry manner—by foot! The other pilots finally arrived with roaring motors and sweeping wings.

With the U. S. Punitive Expedition in Mexico, the 1st Aero Squadron was detailed to reconnaissance flights, carrying important dispatches, and to keep up communications with the advance troops. Numerous flights were made but when ordered back to Columbus, after a month's active service, only two of the eight Jennies flown into Mexico were still in service. Pilots shied away from the two as they were unsafe for further field service.

MAY, 1917, brought to the squadron long-expected orders to prepare for immediate foreign service. America was in the war! Aug. 13th the aviators, sweltering in tight, high-collared tunics, set sail for Europe with Major Ralph Royce in command. The first American squadron arrived at Havre on Sept. 3rd; remained at a British Rest Camp until the 5th, then entrained for Etamps. Sept. 12th it headed for Avord to undergo training at a French aviation school.

After 20 days the squadron moved to Issoudon, the greatest war-time aviation center in the world, with 9 flying fields covering 36 square miles. Did those Americans fly? They got up in the "air," but they didn't fly. They were kept busy doing construction work.

But the war took on a new meaning for them when, on Oct. 19th the outfit moved to the Amanty airdrome in the quiet Toul sector, and was equipped with French A. R's—Avion Renaults. They were at last at the Front!

Nineteen observers arrived the day after Thanksgiving Day to take up an intricate course of aerial observation and radio "dit-dahs" that was to require over four months of hard study. They were the first Americans to be trained in this work in France and were the first American observers to fly over the Front.

Those men, who put the 1st Aero Squadron into the foremost rank of American observation squadrons were: Captains R. L. Walsh and R. R. Allen, 1st Lieutenant G. L. Hammon and 2nd Lieutenants C. H. Style, J. C. Wooten, S. W. Thompson, S. Bird, R. H. Neel, W. B. Cooley, J. W. Cousins, F. D. Meyers, W. G. McNuty, J. C. Henderson, B. Saunders, Jr., R. H. Whiter, J. Phinizy, A. M. Seymour, H. H. Perry and J. H. Snyder.

This SPAD XIII, on exhibition in the Smithsonian Institution, Washington, D. C., has a record of seven victories and an extended service.

Christmas found the Yank aviators excitedly putting up a large Christmas tree in a hangar and profusely decorating and trimming it with gifts. They had voted to give the French children of Amanty a real old fashioned Xmas. When the boys and girls arrived they were lost in admiration of the tree.

An airplane motor was soon heard purring overhead and all rushed outside fearful of an enemy attack. Instead they saw a fighting A. R. land and roll right up to the hangar. The children cried in delight and utter amazement when 1st Lieutenant W. V. Barneby stepped out, traditionally dolled up as Santa Claus, red suit, white false whiskers and all.

Is it any wonder the men of the 1st Aero Squadron won their way into the hearts of the French people? Here were men facing the strife of war and sudden death, playing the game of childhood's most wonderful illusion—Santa Claus.

Of the work in the quiet sector Major General Mason M. Patrick, then Chief of the Air Service, wrote:

"From a command point of view the work of observation squadrons in the great Toul sector were unimportant. There was no marked opportunities for obtaining information of value as no active operations occurred. Here pilots and observers made rapid strides in learning the details of their duties and the organizing and operating of squadrons as a group was smoothed out without paying the ordinarily heavy price of mistakes of war. The principles and methods established here stood the test of time and war."

The 1st Aero Squadron was now ready for the more serious work in which it was soon to become engaged. In April, 1918, the 1st Corps Observation group was organized. The 1st, 12th, and 88th Squadrons comprised the group. The 1st moved to Ourches and was equipped with Spads. It began operations on April 12th.

On Saturday, April 13th, one day before Alan Winslow and Douglas Campbell shot down the first two victories accredited to the U. S. Air Service, the 1st Aero Squadron had its first combat. Three enemy planes singled out Lieutenant Coyle for an easy kill and came down on him out of the sun.

Coyle, possessed of an American fighting heart and the *esprit de corps* of the 1st Squadron, raised such hell with machine guns, and maneuvered so skillfully that he returned safely to report . . . "machine received one bullet hole." April 14th, Major Royce, C. O. of the 1st Aero Squardon, made the first American reconnaissance over enemy lines. For this he was later decorated with the French *Croix de Guerre.*

May 6, 1918, the squadron received the following memorandum from the Office of the Chief of the Air Service:

"For long and distinguished service the following authorization to display distinctive insignia is cited: 1st Squadron (Observation), a miniature American flag. For distinguished and arduous service in Mexico."

From that day until 1932 the squadron's airplanes were to be identified by American flags painted on their fuselages.

OPERATING under the Administrative Control of American 1st Army, the squadron's mission was primarily to keep the command informed by visual and photographic reconnaissance of the general situation within and behind the enemy lines. Routine schedules called for daily close-range reconnaissances of the sector, special missions, artillery adjustments in particular, many long-distance reconnaissances far into Hunland, and toward dusk a scouting flight to spot and report the location of hostile batteries in action.

Flying a plane on a photographing mission is one of the most difficult and exacting tasks facing a pilot. During the World War, the old type cameras made it plain hell on wings. The pilot was forced to fly an even, dead-to-rights straight course.

He could not vary from right to left. Neither could he lose or gain altitude; if he did, the series of pictures taken by the observer would be thrown out of

(*Continued on page* 136)

Awaiting Action in Africa

by D. M. DELANEY

Whenever there is a major league scrap on a small scale, you'll find the boys rarin' to go. Just what the yen for a trip to Africa signifies, we do not know, but it's there—and how!

IN Milwaukee, there is a group of pilots anxiously awaiting developments in the Italo-Ethiopian situation and, if Haile Selassie can gather together the necessary cash and passports, he will have the nucleus for an air force. All of the Milwaukee boys are experienced pilots and, numbered in the group, are some expert mechanics.

The flyers have been busy with cables to the Ethiopian government which is now weighing the advisability of employing these soldiers of fortune. The boys are anxious to make the trip and get into some excitement not to mention the gold that will be theirs if they are employed in actual combat.

Heading this group is a veteran soldier of fortune. He is Elmer (Buck) Leighton, an old-timer in aviation who has been flying regularly since 1919. Leighton knows the trials and hardships of flying in the employ of a foreign government and under the most adverse flying conditions.

It was back in 1920 that Leighton was flying for an oil concern in Tampico, Mexico. Things were beginning to pop in the country across the Rio Grande. The promotional job of flying for an oil concern was just so much routine work for the adventurous young American and he decided to get into the fireworks during the Obregon affair.

In 1921 he quit his job and joined the Mexican Federals. At the time he thought his enlistment would be a lark but the pay was good and so Leighton stayed on the job for four years. Flying over the mountainous country in ships that were far different than the modern planes proved more work than fun. Treacherous bandits were strung through the country from the Rio Grande to the capital and the thought of a forced landing on the rough terrain was enough to give one the jitters. If one were lucky enough to survive a crackup in this region he always had the lurking bandits to contend with and everyone knows that these ruffians show no quarter to anyone. Leighton's excellent flying on the bandit chases and reconnoitering won the admiration of his superiors and he soon was given the rank of colonel.

The hardships of this kind of fighting were vividly demonstrated one day when the young American met with an accident. He was back in the mountainous region of Mexico on a plateau. In turning over his propeller the engine kicked and the prop caught the young flyer on the arm, breaking it in two places above the elbow. There were no doctors or hospitals handy. The injured man was placed on mule-back and a long journey started through the hills. After nearly a day's journey by this means of transportation, he was placed on a slow train and it was two days before he reached a hospital and could have the injured arm set.

Bandit-chasing and treacherous flying was not without its romance, however. It was while Leighton was sporting the rank of colonel in the Mexican army that he met a sparkling dark-eyed senorita. The meeting blossomed into love and the pretty girl and young American were married in Mexico at a brilliant fiesta.

This is Elmer (Buck) Leighton who has had a long career in aviation and a lot of experience outside our borders. He heads the throng of the "on to Africa" air contingent.

Leighton has had an abundance of experience in all types of flying. He flew for the Kohler air lines on the Milwaukee to Detroit run over Lake Michigan. He also was employed by Northwest Airlines. For years he was chief pilot and flying instructor for the Midwest Airways at the Milwaukee County airport. He also worked for the St. Paul Flying Service and Associated Aviation.

Included in the Milwaukee group is another man that Ethiopia could use to excellent advantage. He is Ed Mulick, a former airline official and an experienced airplane builder having been employed for several years in the manufacturing end of the business. Mulick now is actively engaged in aviation in Milwaukee.

Among the others who have indicated they would like to get into the fracas are Jim Hansen, Fred Karsten, Ralph Brichta, James Heinskill, John Kometer, Henry Beck, Irv Miller, Chet Carver, Glenn Russell and Elwood Rokenbrodt. In addition to being expert pilots, many of the above mentioned are experienced instructors and would be very helpful in building up a native air corps.

Many of them have had several years of flying experience and are adept at navigation. Hansen, for example, spent several years in the capacity of flying salesman for his father's concern and his work brought him to all sections of the country. He also has been an instructor and at present is employed by the Madison Airways. Besides the pilots there are several mechanics who are anxious to make the trip abroad. They include Bud Fischer, Chet Carver and Herman Solomon.

Incidentally, if Uncle Sam should ever get into trouble, he will find a flock of potential war-birds in the Milwaukee area. Since the Italo-Ethiopian trouble has been brewing, flying-schools in this region have noticed an increase in inquiries on student training.

But gold more than glory is the goal of the group of experienced pilots that are awaiting word from Ethiopia. Flying a fighting machine for a foreign country is one of the most lucrative of jobs besides providing an abundance of thrills and these modern soldiers of fortune are ready to travel any place on the globe to sate this desire.

But, there is a danger spot ahead for these soldiers-of-fortune that does not lie entirely in Africa. It lies right here at home in the person of the Federal Government which has but little patience with made-to-order soldiering when it comes to mixing up our relations with friendly countries, such as Italy. We have only to consult the record of Bert Hall to prove that fact.

There is always the danger that a friendly nation will regard the sentiment of a few fortune seekers as representative of the people at large, thus engendering a distrust that is not deserved. (We believe that this is traveling over dangerous ground and is therefor to be condemned: Editor.) However, this is only a unit of adventurers that are bringing the sole responsibility upon themselves.

In the meantime these flyers at the Curtiss-Wright airport are keeping in readiness for the word from Ethiopia. They know there is a dearth of flying material in the African kingdom and hope to be called soon.

"Haile Selassie, we are ready," is the motto.

Control Surface Area

by PEYTON AUTRY

WHEN the amateur light-aircraft builder decides to construct a plane of his own design, he is usually confronted with a problem of designing his ship to give the best performance, stability, etc.

In gathering data for the proposed design he soon becomes involved in extended mathematical and engineering methods which are beyond the comprehension of anyone but the well-versed aeronautical engineer.

Due to conventional lightplane practice of the past few years, on wing proportions, weight and power, the homebuilder can obtain fairly satisfactory performance from his ship.

It seems that the amateur has been content, in many instances, to merely sketch the design of his tail-surfaces to suit the appeal of his eye, without any consideration as to the proportions relative to other characteristics of design.

For the conventional design, such as the high-wing parasol, the following formulas for empennage area will be found very reliable, having been employed on a variety a very successful lightplanes.

Notation:

Sw = Area of wing in sq. ft.
Ss = Area of Stabilizer in sq. ft.
Se = Area of elevators in sq. ft.
Cw = Chord of wing in feet
f = Tail length in feet (c. g. to rudder post)
Sf = Area of vertical fin in sq. ft.
Sr = Area of rudder in sq. ft.
bw = Span of wing in feet

The formulas are:—

(1) $Ss = \frac{.27\ Cw\ Sw}{f}$ (3) $Sf = \frac{.005\ Bw\ Cw}{f}$

(2) $Se = \frac{.25\ Cw\ Sw}{f}$ (4) $Sr = \frac{.015\ bw\ Sw}{f}$

The required aileron area will be from 15 to 18 percent. of the total wing area.

Ryan Students Hold Airmeet

UNIQUE in the fact that 100 percent. of its entries were student flyers was the student air show staged by the Ryan School of Aeronautics, at San Diego's municipal airport. The purpose of the show, was not to provide "thrillers" so much as it was to demonstrate the fact that the handling of a plane in normal maneuvers is possible with only a limited amount of flight training.

The program consisted of four main events, including formation flying, spot landings, precision spins and bomb dropping. Winners of the respective events who were awarded prizes by T. Claude Ryan, were Walter McIntyre, Chicago; Cliff Hornung, Oxford, Ohio; Alex Hyde of Buffalo, N. Y.; and John Milner of Wilcox, Ariz. Following the student contests John Fornasero, chief flight instructor, flew one of the new 125 h.p. Ryan S-T planes in a series of aerobatics.

What We Show on Our Covers

(See Front and Back Covers)

OUR front cover subject for this issue is the keen looking little Italian plane, the "Vale." It is of what might be called an all-'round type, being specified by its builders as a secondary trainer for pursuit pilots, as a pleasure craft for the private owner and as a touring plane with a considerable radius.

It was designed and built by Pietro Magni at his works in Milan (Taliedo), on rather unusual lines, rather daring innovations in these days of gas-pipe and sheet-metal construction. Both the wings are of wood construction, monococque shell type, which go a long way toward the restoration of common-sense practice. Authoritative sources pronounce a top speed of 186 m.p.h. with only 130 h.p. and a cruising speed of 155 m.p.h. This most excellent performance vindicates the designer's radical departure from present day practice.

Much attention has been paid to the wing design. It consists of a fabric covered and doped plywood shell, with double spars, wood half-ribs and reinforced by a plywood shell. The wing is in halves, tapered and provided with an arrangement by which a portion can be slightly rotated to provide variable incidence and variable camber. This is in accordance with Magni's patent.

Magni has gone back a number of years to pick out a fuselage type that has proved both staunch and light. In short, this is a monococque plywood fuselage. This does away with heavy trouble making parts such as tie-rods, welds, wires and similar parts found in the conventional planes. It is entirely self-supporting, not easily crippled by shot or shell and makes a smooth aerodynamically perfect job. Further, it is accessible for inspection at a number of points and can carry local patches without excessively stressing the other portions. We wonder how soon this meritorious idea will be revived in America?

Like the wing and fuselage, the tail group is formed from a plywood shell with a stiffening longeron connecting it with the fuselage. The elevator flaps are prolongations of the stabilizer which are treated as with the ailerons. The tail wheel is oriented with the rudder movements, is provided with springs and is supplied with a streamline fairing

Elastic wheels (Magni's patent) are combined with a shock-absorber system by which system the wheels travel in and out in a direction perpendicular to the earth. This gives both static and kinematic advantages that absorb shocks efficiently and, at the same time, give stability while taxying over the ground.

Power is provided by a Farina T-58 engine developing 130 h.p. The power plant is mounted on a four-point bracket connecting with the forward firewall which greatly improves the accessibility and makes it easy to make adjustments and repairs.

SPECIFICATIONS OF THE "VALE"

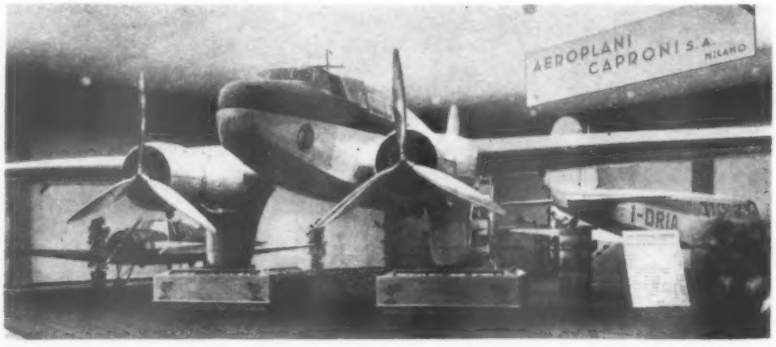
Wing span	8.90 m.	29'-2"
Length	5.50 m.	18'-0"
Height	2.02 m.	6'-7"
Weight, empty	450.0 kg.	990 lbs.
Useful load	225.0 kg.	495 lbs.
Total weight	801.5 kg.	1764 lbs.
Cruising radius	1000.0 km.	600 mi.
Top speed	186 m.p.h.	
Cruising speed	155 m.p.h.	
Stalling speed	54 m.p.h.	

The insignia shown by the front cover is the same as on all Italian military and naval planes.

On the front cover, the "Vale" is shown escorting a flight of Caproni bi-motored planes, Type "123." This ship is said to be a very effective means of transporting troops, and is in extensive use.

Our rear cover shows the low-winged Keith-Ryder plane that broke all records between Vancouver, B. C., to Agua Caliente, Mexico, clipping one hour, 12 minutes from the late Jimmie Wedell's record. It is owned by the Gilmore Oil Company and was flown by Earl Ortman, test pilot. The power-plant is a Wasp, Junior, of 400 h.p., fitted with a variable pitch propeller.

The plane has a span of only 25-feet. It has a duralumin fuselage and plywood wings equipped with flaps.



A Caproni bi-motored Caproni "123", the plane shown on the front cover escorted by the "Vale".

Around the Country With the Aviation Clubs

Contributions from aviation clubs will be welcomed by this department which is growing in popularity with every issue. Send in your club notices—we'.l print 'em.

ORGANIZATION of the Air Defense League, Inc., marked the return of J. Kegerreis to aviation who has had extended experience in conducting aviation schools. This gentleman is now president of the League at the Indianapolis (Ind.) National Headquarters.

The purpose of the League is to stimulate aviation by teaching the youth of America to fly and, to this end, boys between the ages of 15 and 21 years are eligible for membership and will be taught to fly without cost. The only expense will be a nominal monthly membership fee and their board at a central encampment.

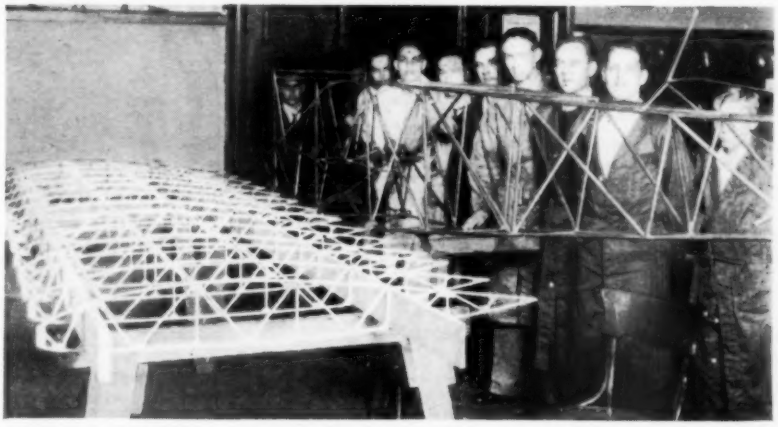
It is expected that at least 10,000 boys will be enrolled by next June and, of that number, 2,500 who have made the highest grades, will be rewarded with actual flying instruction at the camp. The summer camps and expenses incurred will be supported largely by subscriptions from individuals and organizations, most of whom have already arranged to assume this expense.

Youths who have had previous military training, or who have been members of the Boy Scouts, will be particularly welcomed as members of the League as they will be qualified to act as flight leaders. For further particulars, address: Air Defense League, Inc., 907 Roosevelt Bldg., Indianapolis, Ind.

* * *

METROPOLITAN AERO CLUBS, being sponsored by Frank J. McPeake, Jr., in and around Boston, Mass., is now expanding beyond the suburban limits of Boston.

Mr. McPeake, is now organizing a group of young people (in their twenties), to represent Boston and to operate from the Boston Airport. He has contacted William Boyde, formerly in charge of the mechanical work on the last Byrd Expedition, and it is hoped that Boyde will join the organization and take charge of the overhauling of the club ships. Address: Kermit Kearly, Secretary, Metropolitan Aero Clubs, 3 Beacon St., Boston, Mass.



Members should be given some shop instruction as well as flying lessons to acquaint them with the details of the plane.

* * *

CANADA, in the person of Norman Bruce, Garnet Block, 10th St. and 2nd Ave., N. W., Calgary, Alberta, has sent us some mighty interesting dope on glider clubs in Canada.

Our correspondent is a man of experience, for he has organized two clubs and has been responsible for the maintenance of the ships in three clubs. What a man! He sure can take it on the chin! The editor has fooled around with one club long enough to know that the members can hand out plenty of punishment to anyone who tries to accomplish anything.

His photos are marked "Calgary Glider Club" so that we cannot be censured for believing that this club is still functioning, although nothing much is said on the subject.

"I know the many ups and downs, the petty grievances, waning interest, overconfidences and—again—the fullest enjoyable happy moments of success—on the members' first hops."

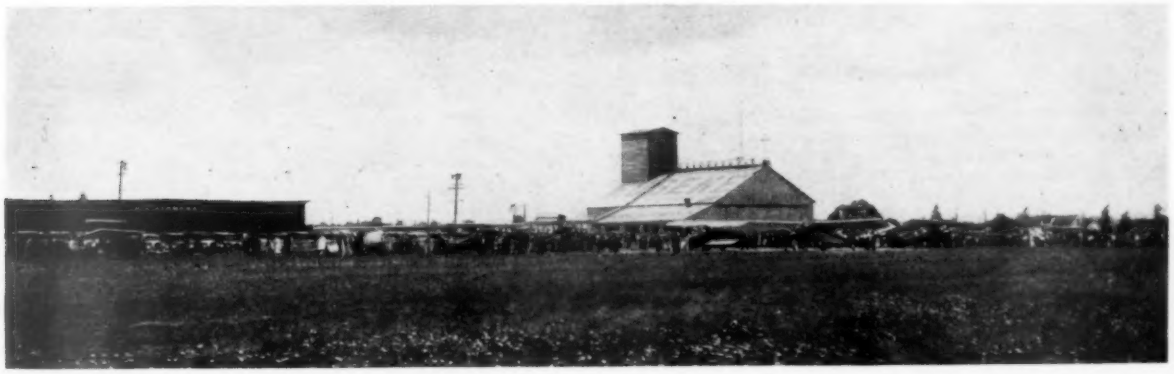
Well said, in well chosen words, Mr. Bruce. We've all been through the mill—and we'd all do it all over again—for a penny.

* * *

"WAY OUT on the Pacific Coast, Eugene, Ore., to be exact, is a mighty prosperous flying club of national reputation. This is the Private Flyers Association of Oregon, which, from time to time, has been mentioned in "What Our Readers Are Building."

We are in constant touch with this active aggressive group through the medium of their club bulletin, "Fly-Paper." It is our great pleasure to get each issue and dig through it word by word to the last advertisement because it is a live and interesting sheet that personifies the spirit of aviation. And have they the active flying members? We'll say they have.

It is quite surprising to read the list of membership and to see how they have promoted the cause of aviation among all classes of people in Oregon. The roster



This is the lineup of the ships belonging to the Private Flyers' Association, Eugene, Oregon. This shows the dimensions of this fine prosperous organization in a state that favors the amateur and private pilot.

includes restaurant men, machinists, electricians, salesmen, a truck driver, etc., etc. The officers are: Yale E. Smith, president; Ferris E. Ward, vice-president; Elmer L. Smith, secretary-treasurer.

Just at the present time, they are deeply engaged in arguing the pros and cons of the new state laws, in particular, the Senate Bill No. 62.

Many interesting points on lightplane construction and design were brought up in this discussion by the various members in regard to proposed limitations of power, wing-loading, flight tests, license cost, medical examination and similar items that affect flying in the State of Oregon.

The proposal of Roy P. Fry, Hood River, Ore., that the license fee be restricted to $5.00 per annum with no property tax, strikes us as a mighty sensible proposal.

Both Mr. Fry and W. F. Tanton, Springfield, Ore., are opposed to horsepower limitations as they both believe that such a regulation would cripple many experimenters. They also believe in limiting the cost of physical examinations to a low figure. Again, as usual, thumbs are down on stress analysis requirements.

* * *

YOU should see what the Towanda Flying Club, 506 Main St., Towanda, Pa., is doing and has done! Miss Genevieve Crayton, secretary of the club, tells us that they bought a Taylor Cub on September 28, and to the date of her letter, they have soloed fifteen of the students with a total of 265 hours. Yes, that sure is going some.

According to accounts, the club is in fine shape and everybody is enthusiastic. They are giving each member time at $1.00 per hour plus the weekly dues of $2.50. Miss Crayton says, "If you can tell us of another plan that is any cheaper, let us hear at once, or if any other club would like to be advised, tell them to write." And so, fellows, as we most certainly can't suggest anything that would be an improvement on what they have done or are doing, we think it would be a fine thing to get a few side-lights from this most progressive group. The rates are reasonable and the students are getting real action, so what could be sweeter?

The recently elected officers of the Towanda Flying Club are: Leo Minier, president; Carl Moore, first vice-president; Vyron Dibble, second vice-president; Genevieve Crayton, secretary, and Barney Dutcavich, instructor.

Well, so long folks and thank you for writing. We hope to hear from you again concerning your progress and happenings.

* * *

DO you remember E. F. Owen's plans for a federation of lightplane owners and builders that appeared some time ago in P. A.? Well, you should see the flock of letters that have come to this office and Mr. Owens in person since

(*Concluded on page* 141)

Aeronautical Instrument Mechanics Important

Describing the details of this little known but essential aeronautical occupation, now being made a feature of the mechanic's course offered by the Boeing School of Aeronautics.

This tremendous array of delicate and accurate instruments carried by a transport plane require the careful attention of a mechanic specialising in instrument repairs.

THE duties of instrument men are more exacting as to precision and detail than those of any other aeronautical workman. Two types of workers serve in this field, viz., instrument repair men and instrument installation men.

The instrument repair man handles the maintenance, repair, synchronization and adjustment of a variety of instruments involving such widely different principles as gyroscopes, thermocouples, and vacuum capsules. The various classes of aircraft instruments differ so much that some superintendents of instrument departments require specialists for each type.

While this system is in vogue at a number of larger repair bases, in many places a single instrument man must perform all the instrument work including installation and checking. This requires skill in the handling of all classes of instruments.

The instrument installation man must have the skill and precision required of an instrument repair man. His duties involve checking instruments with the plane in flight while occupying the co-pilot's seat, and removing such instruments as need attention and replacing them with others that have been carefully checked either by himself or other workmen. To insure their functioning properly in flight, he must also make a final check aloft of replaced instruments.

Instrument repair work is necessarily confining and may involve eye-strain even when lighting conditions are favorable. For this reason, good eyes are essential. When the worker's duties also involve installation and checking, less difficulty will, of course, be experienced in this respect.

Previous experience in other fields, except as it shows an aptitude for instrument repair work, is of little direct value to an instrument man. Even expertness in such detailed work as watch repairing is no guarantee of success,

(*Concluded on page* 143)

Instruments are absolutely essential for the guidance and control of super-ships such as this Boeing bomber.

Auto Engine Conversions

by GLENN D. ANGLE

And now the author, an aviation engine authority of note, presents his views on automobile engine conversions, the attitude of the Bureau of Air Commerce, Mr. Vidal's attitude and other salient features that are of great interest to amateurs. So far as possible, POPULAR AVIATION presents both sides of a story, in fairness to all concerned.

SANE and serious-minded aircraft engineers in all parts of this country have become deeply concerned over the irrational programs sponsored by the Bureau of Air Commerce. To them, and to the industry which they represent, such programs appear as an extravagant waste of money and energy which might well be turned to more constructive purposes.

No doubt, these so-called safe and cheap airplanes, as well as the conversion of automobile engines for aircraft installation, are being promoted in the profound belief that something revolutionary will result. Of course, there always is such a possibility, even though rather remote. But, among those well versed upon matters pertaining to the design and production of aircraft and engines, only a small minority hold to the belief that all this will lead to worth-while results.

In the meantime, the struggling manufacturers of light aircraft and engines are finding it extremely difficult to make any progress while confronted with the sales resistance created by misleading and premature publicity emanating from the Bureau of Air Commerce with reference to their projects. One may find some justification for the opinion that there exists even greater intent upon attaining personal glorification than serving an industry which they have been appointed to represent.

Or possibly, this is just another in a series of synthetic measures—similar to plowing under crops and slaughtering baby pigs—through which some persons are stupid enough to believe might suddenly elevate the aircraft industry to the level of those which have required many years to build. Be as it may, there is little to add to the widely discussed and written comment which is now commanding the attention of everyone earnestly interested in the promotion of aircraft for commercial purposes.

So far, not much has been written on the negative side of automobile engine conversion for aircraft. The features of such programs are being presented prominently each month in periodicals devoted to aircraft subjects, as well as appearing as news items and editorials in our daily newspapers. Therefore, in order that we may retain a true sense of values, it seems about time that we consider some of the disadvantages, particularly with an eye toward the future.

The conversion for aircraft of internal combustion engines designed especially for automobiles and motorcycles has been going on from the earliest days of flying. Consequently, the Bureau of Air Commerce is sponsoring an old and rather moth-eaten idea which, if it actually had the merits ascribed to it through official channels, should have developed some commercial aspects long before now. This is simple reasoning, and it invites investigation into the circumstances which have caused this idea to suddenly command so much attention.

Aside from a fair amount of improved reliability, and lowered manufacturing costs resulting from mass production, both of which have been effected from year to year in the natural course of development, the automobile engine of the present day remains substantially

THE SPIRIT OF THE AMATEUR

Emil Schon, Preston, Idaho, licks the depression with a converted Chevvy engine which doesn't seem particularly heavy. Or is it because Mr. Schon is particularly strong.

the relatively heavy, bulky mechanism that it was years ago. It is difficult to concede a sufficient improvement in the above mentioned characteristics to warrant further deliberation with regard to these new possibilities, so naturally we must assume that the current interest is not founded upon engineering so much as upon matters of an economical character.

When the amateur aviator completes a successful conversion of an automobile engine for aircraft, he should be accorded all the praise which his earnest efforts and skill deserves. It is of no great moment if he is unable to follow the best engineering practice at all times, so long as he takes advantage of the limited opportunities afforded and completes a first-rate job.

The amateur constructor spends his own money (not tax-payers' money) to build for himself the cheapest possible engine which will deliver the horsepower required. Obviously, no one should criticize such an expediential policy, because we know very well that he probably would not go to all the trouble of rebuilding a heavy engine if a light, durable engine of the same output were available at anything near the same ultimate cost. This state of affairs might be construed as an unfavorable reflection on the manufacturers of aircraft engines, but we shall take up that phase of the situation a little later.

What concerns us for the moment is the fact that amateur aviators have been making these conversions for quite a long time, and some fairly good ones too. Now comes the Bureau of Air Commerce with a similar program of automobile engine conversion — allowing originality to be labeled or implied in the vast amount of publicity which this Government agency is circulating with reference to this comparatively unimportant development.

In the Air Commerce Bulletin dated September 15, 1935, nearly seventeen printed pages were devoted to describing a test on an automobile engine. Did the test of a well-designed aircraft engine, or the test of a converted automobile engine by some of our deserving amateur aviators, ever get as much as one page in this official bulletin? After reading these pamphlets for some time, I cannot recall a single instance of this kind. Is this to be interpreted as deliberate discrimination of the engine manufacturer and engine re-builder? I do not have the answer, nor do I know how to determine what it all means.

Safe vehicles of transportation, whether for use on land or water, or in the air, are sold on the basis of performance, appearance and cost. While the size and shape of an engine have some influence upon the particular style and beauty that may be designed into an airplane, these characteristics do not govern or control appearance to such an extent that salability is materially affected. For this reason, appearance as affected by engine types may be omitted from our considerations.

Up to now, performance has been the most dominating factor in the development of aircraft. From a strictly commercial point of view, there would be no object to carry passengers or freight by air unless the pay load could be transported in less time. Suppose then, for the sake of argument, that the product of pay load and speed represents a symbol of performance for any airplane,

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this being based in each instance upon the useful horsepower delivered by the engine. We may conclude, through a simple process of reasoning, that to maintain this imaginary symbol of performance, a lowered maximum speed would demand an increase in pay load, and conversely, a lower maximum pay load would demand an increase in speed.

Therefore, when a converted automobile engine, weighing (completely installed) from five to six pounds for each horsepower delivered, is substituted for one weighing between two and three pounds per horsepower, we must expect an appreciable speed increase if the performance and usefulness of that airplane is not to suffer greatly by comparison. Of course, we know that there has been no marked gain in speed shown by any of these airplanes powered with specially converted automobile engines of high specific weight.

And now we have Aubrey Blackburne, Columbia, Tenn., with a Ford Motored Pietenpol home-built ship with which he has had success. He has carried one passenger.

It has been demonstrated repeatedly during the past twenty-five years that mechanical flight was not impossible when using engines weighing five or more pounds per horsepower. Obviously, nothing new, and probably nothing useful, is presented by adopting engines in this specific weight class once more. This program seems to resolve itself into a rather reckless sacrifice of performance, and incidently a certain measure of safety as well, just in order to create low engine costs. The success or failure of such a program depends upon whether or not low cost has become so imperative all of a sudden that it is permissible to secure it at the expense of useful performance, the factor upon which aviation has depended primarily for its progress to date.

While it is common knowledge that low and medium-powered aircraft will never become widely used until both initial cost and the cost of operation are materially reduced, it is not absolutely certain that low cost alone will bring about this wider use. Of course, most aircraft enthusiasts firmly believe that it will, so let us all agree on this point for lack of conclusive evidence to the contrary and continue with engine cost, the item of first importance, as our principal topic for discussion.

If it were not for the apparent sacrifice in performance and safety, the Bureau of Air Commerce program might be regarded as a worthy effort to make low-priced aircraft engines available. However, we know very well that if this plan really had any merit, it should have developed long before the present organization in Washington started to function. Ask any man who has tried to market a converted engine and he will tell you that aircraft engines are not sold on price alone. If an aircraft engine, just like any other piece of mechanism, is not endowed in sufficient measure with other essential features, it becomes expensive at any price.

It has been said that efforts will be made to reduce the weight of these converted automobile engines once their practicability for aircraft installation has been proved. That statement is equally as illogical and misleading as many other statements with reference to this program. The conversions now cost several times the original cost of the engine, and incidently nearly as much as would a good light-weight aircraft engine if it ever should be built on a quantity production basis.

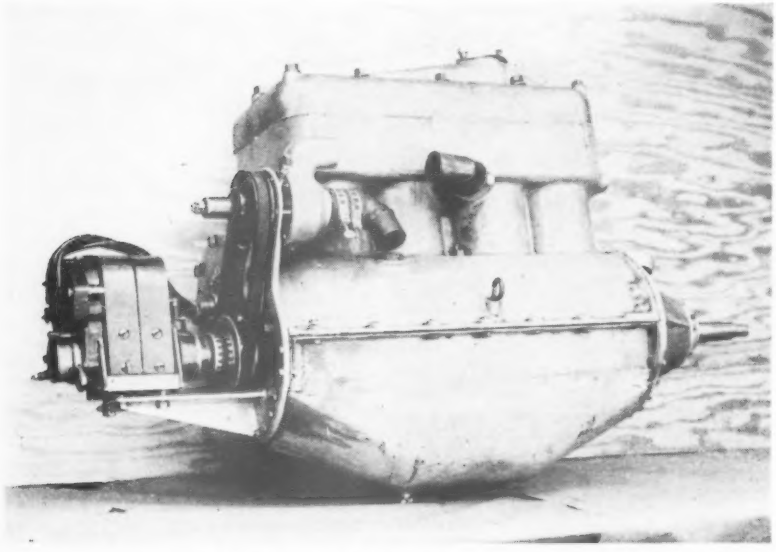
As soon as lighter materials are substituted, which is the only method through which substantial weight reduction can be effected without major design changes, the production cost is again greatly increased. If carried far enough, this figure will approach, or possibly exceed, the present manufacturing costs of aircraft engines of corresponding output, and still the installation weight will range from 50 to 100 percent. more.

Now, if you have followed the analysis closely up to this point, it should be clear that the conversion of automobile engines for aircraft is not only fundamentally unsound, but that it does not promise to lead anywhere in particular. No matter how much energy and money is expended on this program, we still will not have the efficient, light-weight aircraft power plant needed when the job is finally completed.

The program can be justified, perhaps, as an expedient in an emergency, such as the one which confronts the amateur aviator at times. However, no general emergency exists outside one's imagination, so why not spend these vast sums of tax-payers' money (if they must be spent) in such a way as to ultimately produce the type of aircraft engine needed.

The aircraft engine manufacturer is criticized frequently because he does not produce a light-weight low-priced engine. In all strictness, this is his job, and he is fully aware of that fact. Moreover, there is not the slightest doubt

(*Concluded on page* 142)



A converted Ford "A" automobile engine, an example of the type of engine around which the present debate hinges. This successful engine, may it be known, was developed independently of the Bureau of Air Commerce by a man who was in this game a long time before the Bureau got the fever.

Flying Flea Starts at Scratch

Unheard of, three months ago, and beginning with a cold start at scratch, the popularity of the Flying Flea idea has increased with leaps and bounds. If this keeps up, we may be compelled to have a special Flying Flea department.

ENGLAND has lost her war. She tried to soft pedal the word "Louse" and to divert it to the more polite and milder word, "Flea", but the boys would not have it and loudly outvoted the modification, 1,000 to 1. So, in England, it is now the "Louse" as translated directly, literally and correctly from the French, "Pou du Ciel". We haven't given in yet, over here, but we predict that the worst is to come—and soon.

It was as we feared. The fans are sticking them together in all the barns, woodsheds and kitchen-sinks of the country. It's just like the old hectic days of amateur radio-set assemblers, and when a craze starts in over here, as this wave has started, nothing but a shortage of lumber and nails will bring it to a halt. And when we say "nails" we mean "nails".

Just as a word of advice to the esteemed Bureau of Air Commerce, we suggest that all thoughts of licensing these babies be dismissed from mind. Election time is near, and any interference with Louse production, at its present fever heat, will spell the overwhelming defeat of the Democratic party. The boys have got their saws and hammers well in hand, and will grimly defy anything but a shortage of raw materials to interfere with their program.

Eugene Vidal's pet project, the $700 airplane, has gone glimmering with the advent of this new $1.39 proposition, so the S.A.F. will have nothing more to worry about from that angle. They are face-to-face with something a lot worse.

There are four Flying Fleas in this lineup, taken at the Orly Airdrome in Paris, France. Henry Mignet is certainly to be congratulated on the success of his idea which has caught like wildfire all over the world.

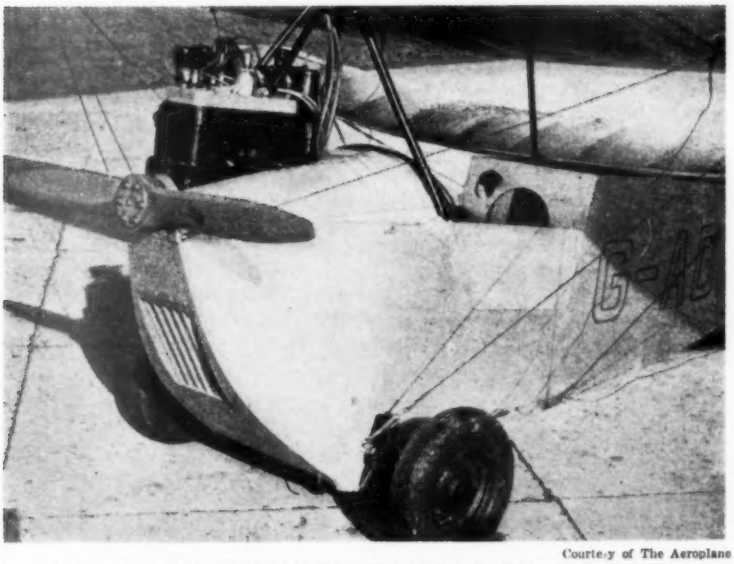
The Cleveland Flying Flea from a visiting artist's sketch gives a good idea of the layout of this model.

In England, they have made a start toward solving the problem, by going into the production of kits with parts of proper design and good materials. This, at once, removes the hazard of building the Flea or Louse with all sorts of miscellaneous junk that the novice may pick up. It is a move in the right direction and should be started promptly over here to avoid a whole lot of assorted trouble that is likely to result from the indiscriminate choice of materials.

So long as the construction of the Flea lies in the hands of advanced amateurs, as has been the case with light-plane development to date, the construction of a Flea type would not be attended by any hazards. But, the great danger lies in the possibility of tyros or beginners starting in on the job without the least idea of what it is all about. This overwhelming desire, to be in fashion, or to follow the crowd by persons untaught in aviation, is what may lead to disastrous results and is what we most fear. At any rate, it may lead to additional burdens in the way of regulations being placed on the shoulders of legitimate amateurs.

One of our readers has just sent in a sketch of a fine job that is being built by Cal Johnson, of the Great Lake Plant, Collinwood, Ohio, the plant that produced the well known Great Lakes planes. Our correspondent claims that it is exceedingly well built, and is being equipped with a special motor of 15-horsepower. The spans of the front and rear wings are 16-feet and 11-feet, respectively, and the expected speed is 85 m.p.h.

Believing that our readers will be



Courtesy of The Aeroplane

This is the front end of the English Appleby Flea equipped with a Cardenized Ford engine of 28 h.p. It looks very neat and workmanlike.

interested in the developments abroad, where they have had more extended experience with the Flying Flea than we have had on this side of the water, we attach the following abstract from an article in the English magazine, "The Aeroplane", which gives a comprehensive sketch of the progress made in England.

The all-British redesigned Pou-de-Ciel with the Cardenized Ford-car motor was publicly demonstrated by Mr. Stephen Appleby. The new machine is very different from the original Pou, and even from the earlier Ford-powered Pou. All the metal fittings have been modified.

The aero-diabolicals of sky-lice have been thoroughly investigated by Mr. L. E. Baynes, who has determined the fore-and-aft limits between which the point of attachment of the hinged mainplane may be arranged with reference to the centers of pressure and gravity, which nobody seems to have bothered to do before. The lack of this knowledge almost certainly accounts for the strange incidents which have happened to home-made Poux.

The span of the mainplane has been increased to 22 ft. which is 2 ft. 6 ins. greater than the French Pou and 5 ft. greater than the original Pou built by Mr. Appleby from which the present machine has been made up. This increase has improved the stability in turns and in straight flight.

The most interesting part of the new design is the 30 b.h.p. water-cooled motor, which is the standard Ford car engine with a special aluminum head with two plugs per cylinder and dual coil ignition, a generator and battery, a down-draught carburetor, a water-pump, header-tank and thermometer, and a special thrust-race set in the crankcase.

Illogically the power curve of the motor is a straight line up to 3,000 r.p.m. and so develops 28 b.h.p. at 2,800 r.p.m. which is cruising speed, and 30 b.h.p. at 3,000 r.p.m. Because of this low speed the motor, which drives the airscrew direct, is amazingly quiet and free from vibration.

The take-off is shortened to 100 yds. and the climb was timed at 300 ft. per min. up to 1,000 ft. The rate of climb of the ordinary Pou is said to be about 100 ft. per min.

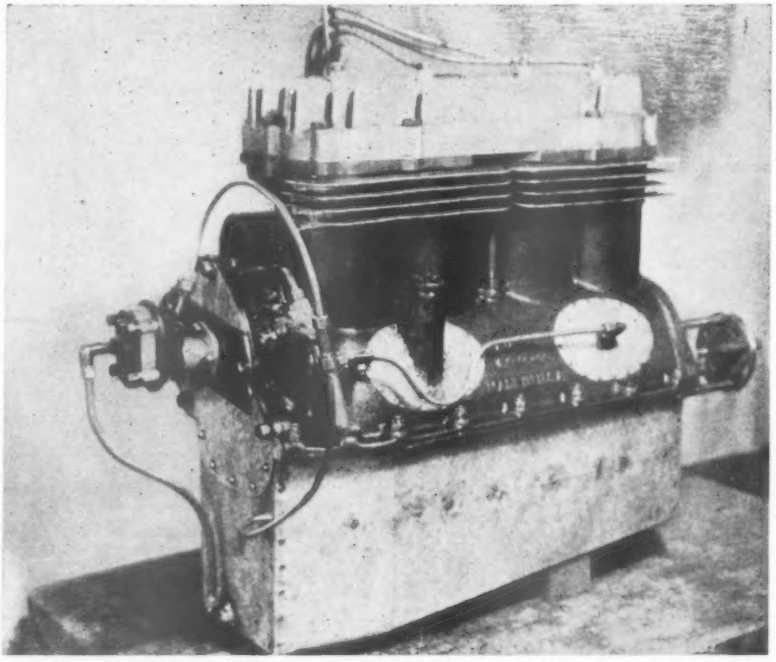
The maxium speed by the airspeed indicator was 70 m.p.h. at 500 ft., and at 2,800 r.p.m. it was 65 m.p.h.

The greater span has made the landing still more extraordinary to watch. The machine is approaching the ground quite quickly with the fuselage parallel to the ground and the motor throttled right back when suddenly at about two feet from the grass its fall is arrested as if by a brake.

The fuselage attitude does not alter, and the movement downwards of the trailing edge of the mainplane is too little to detect from some yards away, when the machine is moving. It then sinks

(*Concluded on page* 143)

An Air-cooled Converted Ford Engine



You'd hardly think it to look at the picture, but it is really a Ford kicker with air-cooled cylinders. This means a great saving in weight and the absence of much plumbing, leaking, etc.

PRACTICALLY the only complaint against a Ford Model "T" engine as a power-plant for a lightplane is its weight and the weight of the water-cooling accessories, such as the radiator, pump, water, piping and all the rest of it. Beside, the jackets themselves are very heavy so that the gross-weight of the water-cooled Henry ran up to a considerable figure.

But Claude Sessions, Waynesville, Ill., has a clever solution for this problem. He got out his hammer, cold-chisel and hack-saw, and started out to convert Henry into an air-cooler. This, of course, was much against the advice of his friends, but he stuck to it until he showed them that an old "T" can be air-cooled and, what is more, air-cooled in a satisfactory manner.

Removing the water-jackets, valve enclosures and other parts giving excess weight, took time and patience but it was not really such a big job as it first appeared. After this was accomplished, most of the strong-arm work ended and the brain-work started in. Perhaps a cutting torch would have made it much easier—and cheaper—but possibly none was accessible.

The first new part to be made was a special cylinder-head of lynite which was designed to increase the compression ratio. Heavy sheet aluminum cooling fins were attached to the cylinders in place of the water-jackets, and this proved to be a comparatively easy job. It will be noted that the fins are of the plate type and do not extend very far down the barrels of the cylinders. Suitable changes were also made in the lubrication system and ignition system and the propeller hub was mounted on the crankshaft, as in other Ford conversions.

To judge from the fact that the lower portions of the cylinder barrels are not provided with cooling ribs, it would seem that much of the heat is dissipated by radiation from the crankcase and by the lubricating oil supply. However, this is simply surmise and while this action may take place to some extent, it may not be objectionable in practice, as such things sometimes turn out to be.

There is one more thing that we would like to see and that is a drawing or photograph of the air-flow control that guides the air-stream around the cylinders. This system has proved to be of great importance with large air-cooled aero engines and it would seem to be equally important here.

It is a well thought out and original stunt and it may yet be the final solution of the conversions problem. To get away from radiators, water, hose and pumps would sure be a relief.

Completed, this air-cooled Ford conversion weighs 150 pounds which is just about 75-pounds lighter than a water-cooled conversion including the weight of the water and radiator. It has cooled well and has proved to be very reliable. Letters of inquiry can be addressed to Claude Sessions, Waynesville, Ill., concerning this engine if accompanied by a stamped envelope.

The World's Planes and Builders

In this third tabulation, continued from the January issue of POPULAR AVIATION, will be found the principal airplane builders of most of the remaining countries. We wish to acknowledge assistance from Jane's *All the World's Aircraft* in making this compilation.

ITALY—(*Continued*)		
Officine Ferroviarie Meridionali, Corso Orientale al Vasto, Naples.	Piaggio P-10.	3-seat observation seaplane, catapult type.
	Romeo Ro.26.	2-seat landplane or seaplane acrobatic trainer.
	Romeo Ro.30.	3-seat military observation type biplane.
Societa Idrovolanti Alta Italia "Savoia", 42, Via Monforte, Milan.	Savoia-Marchetti S-55.	Twin-engine twin-hull bombardment type monoplane flying-boat.
	Savoia-Marchetti S.55X.	Improved S.55.
	Savoia-Marchetti S-66.	18-passenger 3-engine twin-hull flying-boat.
	Savoia S-71.	3-engine 8-passenger commercial monoplane.
	Savoia-Marchetti S-72.	3-engine bomber.
	Savoia-Marchetti S-74.	4-engine long-range commercial monoplane.
	Savoia-Marchetti S-78.	3-seat observation type flying-boat.
	Savoia-Marchetti S-80.	2-seat amphibian sport-type flying-boat.
	Savoia-Marchetti S-80. Twin-Engine Amphibian.	4-seat amphibian.
JAPAN		
The Hiro Naval Yard, Sasebo.	Navy 90-1.	6-seat flying-boat.
The Aichi Tokei Denki K.K. (The Aichi Watch & Electric Machinery Co., Ltd.), 15, Chitose Funakatacho, Navoya.	Aichi AB-3.	1-seat fighter seaplane. Built for the Chinese Navy.
	Aichi Navy Type 92.	3-seat Fleet-Spotter biplane.
The Ishikawajima Aircraft Co., Ltd., 6, Marunouchi, 1-chome, Kojimachi, Tokyo.	Ishikawajima R-5.	2-seat primary training biplane.
	Ishikawajima Light Ambulance.	Cabin biplane for one pilot, one nurse and two stretcher cases.
	Ishikawajima T-3.	2-seat reconnaissance biplane.
Kawanisi Kokūki Kabushiki Kaisha (The Kawanisi Aircraft Co., Ltd.), Naruo Mukogun Hyogoken, Near Kobe.	Kawanisi Observation Seaplane.	3-seat observation seaplane.
	Kawanisi K.F.1 (Navy Type 90-2).	3-engine 6-seat observation flying-boat.
The Kawasaki Dockyard Co., Ltd., Higashi-Kawasaki-Cho., Hyogo, Kobe.	Kawasaki 92.	1-seat all-metal fighter biplane.
	Kawasaki Army Type 88.	(1) as a light bomber, (2) as an observation plane.
	Kawasaki Army Type 93.	2-seat all-metal day bomber biplane.
	Kawasaki C.2.	6-passenger cabin biplane.
	Kawasaki C-5.	3-seat communications monoplane.
Mitsubishi Kokūki Kabushiki Kaisha (Mitsubishi Aircraft Co., Ltd.), Marunouchi, Tokyo.	Mitsubishi Army Type 92.	2-seat observation monoplane.
The Nakajima Aircraft Works, Ohta Gumma-Ken.	Nakajima Navy Type 90.	1-seat ship-plane.
	Nakajima Army Type 91.	1-seat fighter monoplane.
	Nakajima Navy Type 90-11.	2-seat naval observation seaplane.

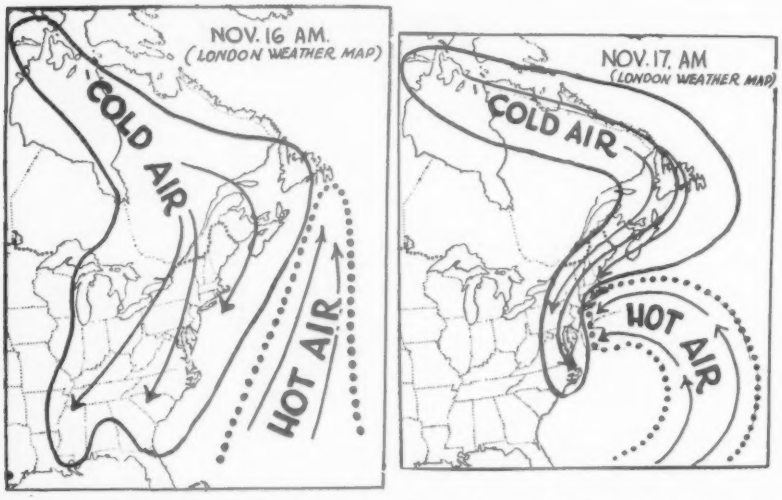
(*Continued on page* 144)

The Breda "39", a new Italian light sport-type monoplane for the private owner equipped with a Colombo S.63 6-cylinder engine of 130-140 h.p. It has a top speed of 137 m.p.h. and a landing speed of 40 m.p.h. Climbing rate is 660 feet per minute.

POPULAR AVIATION'S Expedition

An east wind blows the waters of Lake Erie back on Toledo, Ohio, leaving a portion of the bed of Niagara Falls dry. Prof. Maxwell is walking dry-shod on the river bed.

Freezing ice mists in the high Adirondacks. This lake was steaming in the cold air when the Greenland cold-front swept over it. The cold air lies in a flat sheet upon a warmer and wetter lower sheet of air.



These maps are tracings of the air masses on the days predicted. They are derived from English sources and show how the cold air lay over Canada as well as our own country. It will be noted that Albany, N. Y., the center of operations, was about in the geographical center of the cold air mass that the Expedition traveled to observe.

by PROF. SELBY MAXWELL

Director and meteorological expert of the POPULAR AVIATION storm seeking expedition.

IN the science of geology, going into the field is a useful and indispensable part of the work. All of us who have studied this science must remember the thrill and pleasure of climbing about on the face of cliffs and up and down railroad embankments, looking at the strata of the rocks. It may seem a far cry from geology to weather forecasting, but the relation is closer than one might suppose as I shall set forth.

The air is a geological entity, no less than are the rocks. Air is stratified like the rocks, or, to be quite exact, the air may be likened most to intrusive layers of volcanic rock that thrust themselves upwards in layers, domes and dykes through the more motionless and stationary parts of the earth's crust.

I have just returned from witnessing great lenses of intrusive air, both from polar and from torrid regions, thrust through calmer air, carrying unusual weather with them.

After I had returned from my trip into the Florida hurricane, the editor of POPULAR AVIATION said to me, "Why wouldn't it be possible for you to take a trip for us, to learn more of what goes on in the air and perhaps find facts that will be of interest to aviators?"

"By all means," I said, "I shall be glad to make the trip and I will select for my subject, a storm that will make Page 1 of every newspaper in the part of the country that I visit." And so, I planned a trip into the northeastern states to see a polar air mass in action, a mass of cold air that was scheduled to come down from Greenland over New York state and adjacent areas. This was to be the biggest weather event anywhere in the United States in the month of November. It was.

It was a storm of such magnitude and complexity that it will go down in meteorological history and I am happy to report to you that I observed it all.

The idea of field trips to study weather is new. It is only in the last few years that automobiles have been swift enough and cement roads good enough and in sufficiently close network so that a meteorologist could get from place to place in the country easily and at high speed. As yet, aircraft are too light to risk venturing into the furious weather

Finds Intrusive Air Masses

HERE you will find the full account, by Prof. Maxwell, of the agreement of the eastern storms predicted by him a full twelve days in advance of their occurrence.

This expedition, sponsored by POPULAR AVIATION, was successful in every way, and is a check-up on the theory promoted by Prof. Maxwell. The introduction to his electromagnetic theory of storm excitation, and the part played by the moon in the causation of storms, was published in the December issue of POPULAR AVIATION.

in the centers of storms, but an automobile can go in, so in we went.

The trip was not without some danger. Many of the roads in the storm zone were slick with ice and the precipices were steep. At Narragansett Pier, a great sea wave swept clear over our car. A great wall of white and green water hit us with a "sloppfh." Salt water spurted in at every crevice, our radio storm detector was shorted by the sea water and subsequently collapsed from being waterlogged, and our engine had to be carefully cleaned before it would function again.

The storm at the moment was raging with Force-9, waves were breaking over the roadway, but we went into the action as closely as we dared. The chief danger in entering storm zones is being struck by flying debris. Our car was severely hit four times. Another great danger is from being on a roadway when it collapses. We saw roads that were washed out but none of them went out from under us.

The plan of this storm predicted a series of warm tropical thrusts, rather complex in nature, from Chicago east dating from November 11th to 15th, followed by two days of icy air from Greenland. On the 15th, 16th and 17th there was to be another warm tongue of air coming in from the ocean and just touching the land from New England to the east.

Our plan of action was to leave Chicago on November 11th, proceed to New York state with Albany as a center, intercept the cold air on November 15th and 16th, go to New England to meet the thick weather on the 16th and 17th and then return to Chicago. We adhered closely to this program, and everything came to pass very much as it had been predicted. I will recount to you the various interesting weather events that occurred along the way.

Leaving Chicago in a storm, with a cold-front right behind us on November 11th, we ran to Chesterton, Indiana. I was the navigator and scientist of the expedition, while my brother Alexander was the radio and mechanical expert.

The night was so black and stormy, and we were so wet by the time we got

The cold-air mass advancing. A scene in the Green mountains with the Greenland polar air-mass advancing. Beams of sunlight pass through the open spaces in the cloud masses.

On the lee of the mountain. Freezing mists from the cold air above, are coming over the crest of the mountain. They are being warmed adiabatically as they descend.

Toward Massachusetts, there was more warm air and the precipitation took the form of snow. This snow scene was taken near Worcester, Mass.

to Chesterton, that we decided to put up for the night. This was wise. By morning, the storm had moved on and the temperature was falling, showing that we were on the advancing face of the cold-front. I did not want to lose contact with the rain entirely, for I also had a military problem in my mind, namely, to test the possibility of moving an auto artillery battery from the Lakes to the Atlantic ocean entirely under the cover of rain and cloud.

As you can see, in time of war this would be important. Enemy flyers might be aloft looking for a chance to raid the battery as it moved and, if it could be moved along keeping always in a cover of thick and dirty weather, it would obviously be harder for the flyers to locate it and bomb it.

In my opinion, it would be quite possible to move a battery in this way, because we were able to keep under the cloud the whole distance from Chicago to Rhode Island, emerging only once in Vermont, where I went north on purpose to see the sun shining through the clouds as my cold-front hit.

Leaving Chesterton, we followed close along behind the rain and overtook it near the Ohio State line. The rain was moving east at 29 miles-per-hour, while our cruising speed was around 44 m.p.h., so we had plenty of speed to spare in maneuvering in and out of the rain.

At Medina, Ohio, we felt that we could risk stopping for a hot meal and a warm bed before going on. We did and, in the morning, the experience of Chesterton was repeated—the storm had passed east and the cold wind of the polar-front was once more beginning to blow.

Stopping at Akron, Ohio, for a short time to interview some newspaper men, we went on and near Conneaut, Ohio, we once more ran into the rain. There was a stiff northeaster on the Lake Erie as we got to Erie, Pa., and at Buffalo, N. Y., the storm was thick, wet and windy.

Prof. Maxwell, his car and the radio storm detector.

On the windward face of the mountain. Above the 32°F. isotherm, everything is coated with ice. Below this zone there is only a wet mist. One side of the mountain may be a glaze of ice (windward) while the other side may be ice free.

Waves, running against the wind, coming into Narragansett Bay. The back-wind is blowing the wavetops in spray.

Next morning, we found that the rain had again passed us, but that the northeast wind had blown Lake Erie, which is shallow, back upon Toledo so that the Niagara Falls were partly dry. So we amused ourselves for several hours in walking dry shod through what had just before been a raging rapids above the falls and also in moving about amid the boulders that lie under the dashing waters below the precipice.

In case that the wind had suddenly turned, we might have found ourselves in the position of Pharaoh's Army in the Red Sea, but I did not believe the wind would turn and it did not. The rain was east of us again and the temperature was falling when we once more set out, going by way of Lockport and along the shore of Lake Ontario to Rochester, N. Y., where I wished to buy some films for the cameras.

Outside Rochester, a citizen told me of reports of ice to the east, where most terrible sleet and glaze storm was raging. This was the cold-front storm that we had come to see, so we put on speed and, near Auburn, N. Y., we caught up with the rain once more. On the heights above Syracuse, N. Y., we met freezing mists which made driving so dangerous that we put up for the night and next morning went on into Utica, N. Y., by the valley route, below the clouds.

I had now located the cold-front. It was coming, pouring over my head in billow after billow of icy mist and behind the mist, I was sure, lay intensely cold air. I had no weather map with me and, in fact, I had seen none for almost a week, but before I had started, I had taken some magnetic readings of this storm, and they had shown that I would find the cold air here at this time.

(*Concluded on page* 128)

Gas Model Counter-Torque

by J. B. R.

TORQUE is an engineering term for turning or twisting effort. It is the measure of the ability of the engine to turn the crankshaft against the resistance of the load, just as a lever or crank exerts a "leverage."

All over modeldom we hear this term misused. The model builders, in the first place, erroneously refer to "torque" when they should say "counter-torque." Torque is the turning effort exerted on the crankshaft against the load by means of the piston and connecting rod. Counter-torque is the reaction to the torque that acts in an opposite direction but equal in magnitude to the torque. The counter-torque tends to turn the wings of the model in a direction opposite to the rotation of the crankshaft but the effort is equal in both cases.

The measure of torque, or counter-torque, is the inch-pound or the pound-foot, depending upon the dimensions of the units employed. This is equivalent to multiplying the load at the end of a lever (usually in pounds) by the effective lever length, generally in inches. Thus, if we press down on the end of a lever with a force of 30-pounds and the effective lever length is 50-inches, then the torque is: $30 \times 50 = 1{,}500$ inch-pounds. Similarly, if the piston presses down with a force of 750 pounds on a crank 2-inches long (center to center), the torque is: $750 \times 2 = 1{,}500$ inch-pounds.

It is remarkable that the speed and horsepower of an engine bear a fixed relation to the torque. With constant horsepower, for example, the torque decreases when the speed increases, reaching a maximum at very low engine speeds. In practice, however, the horsepower of an engine also increases with the speed, within certain limits, so that the torque of the engine does not vary a great deal, until we get up to the "knee of the curve" where the power no longer

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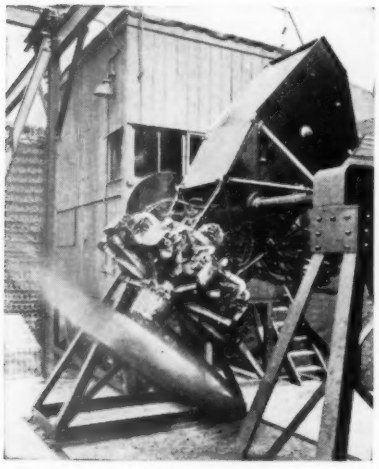
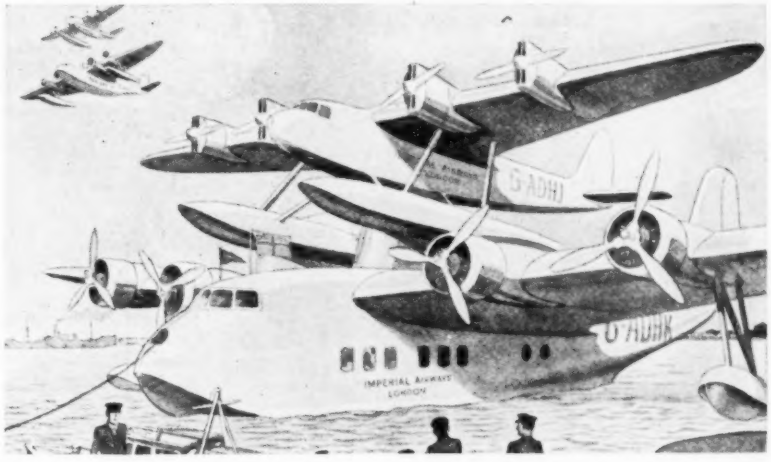


Measuring the horsepower and the torque of a full-size engine.

A Pre-View of the Mayo Composite Plane



The Mayo Composite ship now under construction for Imperial Airways, England, is something distinctly novel in commercial transports.

WE are pleased to have an opportunity of presenting an artist's wash-drawing of the new Mayo Composite commercial plane, now under construction for Imperial Airways by Short Brothers, Ltd., Rochester and Bedford, England.

This peculiar plane, which is really two airplanes, is designed for a carrying capacity of from 3.5 to 5.0 tons, according to the amount of fuel. While the details are not yet known, the carrying capacity is said to be in excess of anything yet attempted on trans-oceanic transport airlines. It is likely that these planes will be used on the Bermuda-New York runs which, by the way, are to be used with the co-operation of Pan American Airways.

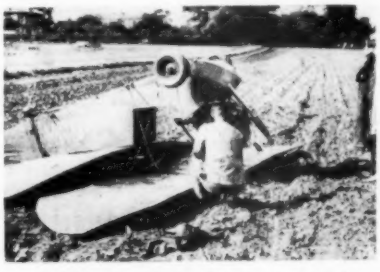
The accompanying drawing shows the large four-motor flying boat resting on the water with the smaller four motor seaplane carried on its back. In the background will be seen the group just as the small plane has detached itself from the larger plane. This arrangement has many advantages, particularly where passengers are to be landed and loaded from wayside points or for shuttle-service where it is not practicable to land the large plane.

Aviation Slang and Metaphor

(*Continued from January issue*)

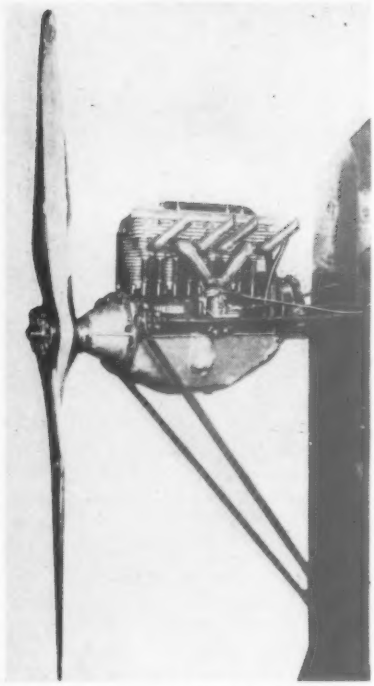
HATE. To be extreme in flying, excessive stunting, etc.
HAY-WIRE. No good. Taken from the practice of barnstormers who often made repairs with hay-wire.
HEAVY-HANDED. A clumsy pilot who over-controls his ship, with too frequent corrections.
HEDGE-HOP. To fly near the ground, flying up and over obstructions as they come into view, leaping fences, hedges, etc.
HEDGE-HOPPER. A small underpowered plane with just enough lift to get a few feet off the ground.
HELIX. Abbreviation for "helical-screw" or propeller.
HEX. Conferring bad luck.
HICK-HOP. To carry passengers a few times around the field for small sums of money. To travel with a carnival.
HOG-HEAD. Airport manager.
HOICK. To ascend rapidly along a steep path. To zoom.
HOLES. Small areas of descending air currents, which causes the plane to drop momentarily when it passes over them, giving the same sensations as holes in a pavement.
HONEY. A nice plane.
HOP. A short low flight of a few hundred yards or less.
HORSE'N HER. Giving the engine more gas.
HORSES. Horsepower.
HOSE-OFF. To wash an airplane.
HOT. Fast, high speed.
HOT-CRATE. A very fast airplane.
HOT-DOWN-WIND. A plane flying at high speed in the direction of the wind so that the total is the sum of the plane's speed and wind speed.
HOT-LANDING. A landing made at a dangerously high speed.
HOT-PAPA. An officer on a warship dressed in an asbestos suit to give assistance to the pilot in case that the ship should crash and catch fire when landing on the deck.
HOT STUDENT. An aviation "bug" who talks nothing but flying.
HOVER. To remain suspended in one spot over the earth.
H.P. Abbreviation for horsepower.
HULL. The inflated envelope of an airship or dirigible.
HUMP. A mountain. "Over the hump" means "over the mountain."
HUN. Slang term for a destructive student.
HUT. Pilot's compartment.

(*Concluded on page* 132)



A crashed Louse turned turtle would be a fitting caption.

The Rhodes "50" Lightplane Engine



This is the Rhodes "50" lightplane engine mounted for test. This is a simple design that should meet with approval.

LIGHTPLANE fans will be interested in the Rhodes "50" air-cooled in-line engine developed by E. B. Rhodes, 5706 Harvard Street, Pittsburgh, Pa.

While this is not a converted engine, yet many parts of well known automobile engines are used in its makeup by Mr. Rhodes, thus, at one time making it a high-duty aero engine at low cost. We are advised that this engine can be built to sell at from $250.00 to $300.00 each when made up in lots of 50 to 100 engines. It develops 50 h.p. on the test-stand.

The cylinders are cast singly and cool perfectly through the use of adequate fins. The propeller is carried by a substantial thrust-bearing.

SPECIFICATIONS OF RHODES ENGINE

Bore of cylinders	3⅞ in.
Stroke of piston	3¾ in.
Weight	180 lbs.
Horsepower	50
Lbs. per horsepower	3.6

Many experienced pilots, who have seen the engine running, claim that it is the ideal size for a lightplane and, while it has had no flying tests as yet, no defects have appeared while on the test stand.

British 'Giro Pilots

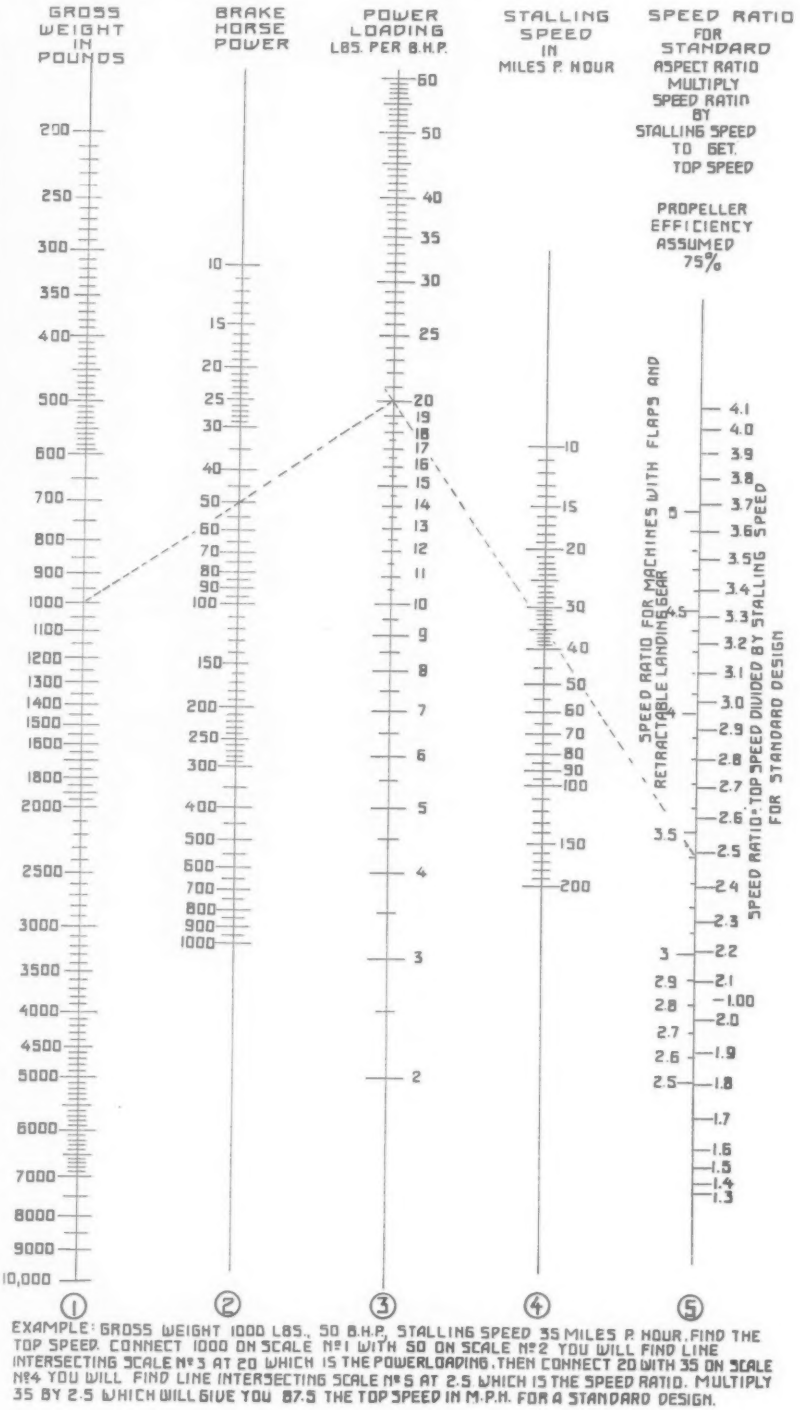
GREAT BRITAIN has 24 men and two women who are accomplished autogiro pilots, but who have never flown conventional airplanes. Also, more than 160 licensed pilots have soloed the windmill craft in the British Isles.

A Nomograph for Airplane Designers

by RAOUL J. HOFFMAN

IN our previous nomographs we have given you the calculations for the gross weight and stalling speed. Knowing the gross weight, the stalling speed and the horsepower of the engine, you can determine the speed-ratio with the aid of accompanying chart.

The speed-ratio is the ratio of the top-speed to the stalling-speed. By simply multiplying the stalling-speed by the speed ratio you will have the maximum speed of the airplane of conventional design, assuming a 75 per cent efficiency of the propeller.


GROSS WEIGHT IN POUNDS
BRAKE HORSE POWER
POWER LOADING LBS. PER B.H.P.
STALLING SPEED IN MILES P. HOUR
SPEED RATIO FOR STANDARD ASPECT RATIO MULTIPLY SPEED RATIO BY STALLING SPEED TO GET TOP SPEED
PROPELLER EFFICIENCY ASSUMED 75%
SPEED RATIO FOR MACHINES WITH FLAPS AND RETRACTABLE LANDING GEAR
SPEED RATIO: TOP SPEED DIVIDED BY STALLING SPEED FOR STANDARD DESIGN
EXAMPLE: GROSS WEIGHT 1000 LBS., 50 B.H.P., STALLING SPEED 35 MILES P. HOUR. FIND THE TOP SPEED. CONNECT 1000 ON SCALE Nº1 WITH 50 ON SCALE Nº2 YOU WILL FIND LINE INTERSECTING SCALE Nº3 AT 20 WHICH IS THE POWERLOADING. THEN CONNECT 20 WITH 35 ON SCALE Nº4 YOU WILL FIND LINE INTERSECTING SCALE Nº5 AT 2.5 WHICH IS THE SPEED RATIO. MULTIPLY 35 BY 2.5 WHICH WILL GIVE YOU 87.5 THE TOP SPEED IN M.P.H. FOR A STANDARD DESIGN.

Tuning Up the Old OX5 Engine

by E. R. SEYMORE

We are glad to present this article to our flying readers because it is authentic and comes from a man who has had extended experience in servicing the now venerable Curtiss OX5 engine.

COUNTLESS discussions have been held regarding the end of the usefulness of the Curtiss OX5 motor. These discussions usually end with the decision that it is just an "OX", that it may possibly be used for training purposes only and in another year it will be put away in a museum with the rest of the antiques.

Most fellows who have had much flying time do not care to fly the old faithful OX because they are no longer students and have passed the kindergarten stage, so to speak. They walk by with their nose in the air, climb into a radial powered job, take off, and leave the best friend they ever had sitting on the ground.

However, there is another class of pilot who, if he wishes to fly, through financial reasons, must continue to use the faithful but slow-motioned OX5. Neither of these two classes of pilot can be censored a great deal since we all know that in horsepower there is the element of safety as well as the thrill which we get from snappy performance.

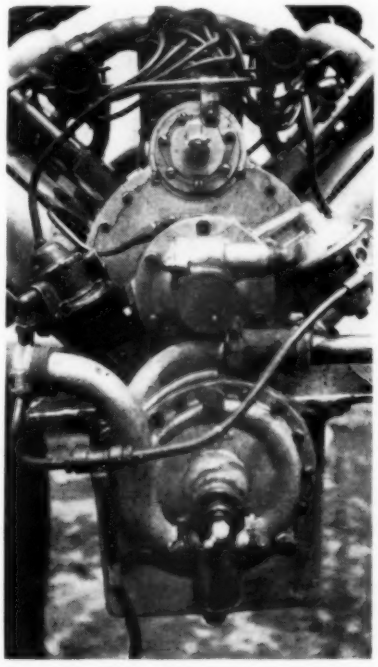
However, I think it would be well for the latter class of pilot, to which I have referred, to stop and consider some of the good and bad points of this OX motor. We all admit that they are probably, in private flying, the most used and abused engine that the industry has ever known.

Their fuel consumption is comparatively low, their reliability is certainly not to be questioned, their upkeep, insofar as parts are concerned at this time, is practically nil. Therefore, there seems to be but one thing which is lacking and that is the old H.P. Insofar as much time, thought and money has been spent in the development of some low priced reliable airplane engines or to the conversion of an engine from the automobile industry, from which we have had no results that are licenseable in OX powered ships, it occurred to the writer that possibly we might still stay within the airplane engine field and arrive at the goal for which the engineers and private flyers are striving.

The Curtiss OX5 engine, if not the most popular, is certainly very numerous in the poor man's field. Therefore, considering the reliability, the excellent materials used and many of the other good points of the OX5, the writer decided to determine if we could not add the one missing point to what is already a good engine.

Remembering that the last OX5's were of the vintage of 1918, let us do a little research work in regard to such matters as the progress made in engine building, etc., since 1918. We find that the modern engine of today does not draw its mixture through a series of manifolds for a distance of 4'7". We also find that they do not draw this same mixture upward but as nearly as possible downward.

We find that they have learned much about manifold sizes in comparison with cubic inch displacement, and we also learn much in regard to the temperature of the gases entering the cylinders and many other things having to do with volumetric efficiency.



Front end of the OX5. Here we see the fuel pumps and their drive, the tach drive, fuel lines and the cross-manifold.

Taking these things into consideration, the first step to take with the OX5 will be to modernize the manifolding and carburetion. This can be done by raising the carbureter up between the banks of the cylinders, discarding the old intake manifolds and building new manifolds, scientifically constructed, so as to allow a free flow of gas to each individual cylinder and so the gas will enter these cylinders at the proper temperature. This can be seen clearly in the accompanying photographs.

This procedure brought forth the problem of properly supplying the carbureter with fuel as most OX5 powered ships depend entirely upon gravity feed from fuselage tanks. This was very easily solved by mounting two diaphragm fuel pumps on a casting at the front of the camshaft gear housing and driven from the cam shaft. The capacity of these fuel pumps is 28 gallons per hour at 700 r.p.m.

It can be readily seen that the two pumps furnish over twice the amount of fuel necessary for the operation of this engine but, as the pumps are inexpensive, it was decided to mount two of them merely as a safety factor in case of the failure of one pump. This is also very clearly shown in the accompanying photographs.

Needless to say, these changes required many long hard hours of experiment and apparently useless work. However, the results at the end of the experiment were certainly most gratifying. One of the hardest problems to solve, after the changing of the carbureter and manifolding, was to ascertain the proper venturi size and jetting of the carbureter so as to maintain the greatest economy possible and still not defeat the original purpose of obtaining more power. This has been completely solved and, as the sizes are known, any job can be re-jetted with very little trouble.

Now, as to the results. I believe the best way in which you can ascertain whether the results were worth the change will be for the writer to give you the exact test data accumulated to date.

Many pilots throw up their hands in horror when you speak of turning an OX5 engine over at its rated 1400 r.p.ms. I will give you some figures now which will probably give you a slight nervous shock but which, I can assure you, are authentic.

This OX5 engine, after the changes were made, turned over at 2950 r.p.m. for one hour. This was accomplished with a club prop made from a standard OX prop with 16 inches removed from each blade. I would not advise any of you gentlemen, who are worried about 1550 and 1600 r.p.m. on your OX5, to lose any sleep over that particular condition.

Now, for some more data. The flight tests on this engine were made with a Waco 90 which had an original top speed of 85 miles per hour at 1425 r.p.m., cruising speed of 75 miles per hour at 1325 r.p.m., using a standard Gardner OX5 propeller. The top speed of the same airplane is, at this time, 115 m.p.h., cruising at 97 miles per hour ground r.p.m. However, the propeller which is now being used is a special type built for a 145 h.p. engine. It was found necessary to make this change in propellers in or-

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der to hold the engine down to the r.p.m. for which the Department of Commerce has licensed it.

The above data, of course, does not mean that every ship housing an OX5 mounted with this changeover will gain proportionally as much top speed. We all do know that, although h.p. contributes to speed, it is not the only necessary element.

We did find that the ship will leave the ground in less than 100 feet with a six to ten m.p.h. wind and loaded with one-half tank of gas (17½ gallons), a pilot and one passenger. The ship with the same load will loop perfectly from level, and the rate of climb has increased approximately 300 feet per minute.

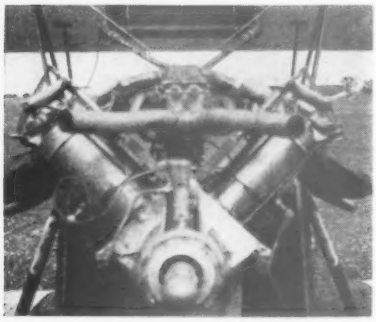
These are just a few examples of the performance improvements which I have mentioned here. However, there are many others which it perhaps would not be so well to mention as some D.C.I. might decide to read this article. I believe, though, that I am safe in saying that this ship, with the present motor set up, will out perform anything in the 125 h.p. class.

Now, let us sum up what we have obtained in the rejuvenated, much used and abused OX5. First, we have reliability. Second, low cost of mechanical upkeep. Third, a motor, due to evenly distributed carburetion, that is as smooth as anything you have flown. Fourth, low fuel consumption and a motor capable of cross-country work, one which gets you out of short fields and tight spots. In fact, you have really added the missing point which was necessary to make the OX5 once more a desirable engine to fly.

And what more could you ask for on a few hundred dollars investment.

I might add that the writer has flown this engine over 100 hours, the greater portion of which has been cross-country flying. He has found no trouble in averaging better than 90 m.p.h. cruising speed with a fuel consumption of less than 8 gallons per hour, during which period it has not been necessary to grind a valve nor even so much as drain the carbureter wells. And the old girl is still ready for a trip of practically any distance any time the writer is ready to go.

END.



Looking at the rear end of the OX5, we see the carbureter air intakes, cross-manifold and carbureter mounting.

Say! Do They Treat 'em Rough in Iowa!

This is the little Pietenpol which has given such excellent performance and satisfaction. She flies and flies unless interrupted by fool state laws.

THIS is a story that everyone should listen to. Not because of its literary style, because it has none, but for the reason that it tells of an intolerable situation that has been built up in this country—a continuance of the old German intolerance that spread "VERBOTEN" all over that unfortunate country.

And now we have a "verboten" regime in this country, twice as arrogant and ten times as domineering as any authority ever ground into a kaiseristic militaristic feudal barony. A condition that suppresses initiative, penalizes ambition and puts to naught any pleasureable pursuits that do not please the mighty state authorities in charge. And when I am speaking of intolerance I speak of the present autocratic state aviation laws, conceived in ignorance and enforced by brutal might, that are retarding aviation progress in this country.

The latest atrocity, brought to my attention, is the arrest of Lurlin Collins, Marshalltown, Iowa, and Frank Shaw, Independence, Iowa, for flying an unlicensed plane in the State of Iowa. The heinous crime committed by these gentlemen was the flying of their own lightplane into the supposedly free air of the State of Iowa, wherein both Collins and Shaw are both citizens.

Last year, Lurlin Collins was arrested on similar charges, was fined and given a jail term of 30 days. The sentence was suspended, however, and Collins was paroled to Sheriff C. E. Wicklund. At that time, Collins was flying his brother's plane, which was later grounded, but this spring, Lurlin Collins purchased a plane similar to that owned by his brother. The information against Collins was filed by a state department of justice operative, it is said. This is Shaw's first arrest.

Now, as to the capabilities of the ship that Collins was flying, I will reproduce the letter sent by him to POPULAR AVIATION. This straightforward letter tells the same story that hundreds of other readers have mailed to us in regard to the excellent character of the Ford powered Pietenpol Air-Camper. Here we go:

Dear Sir:

I am sending you a photo of my ship with a couple of newspaper clippings that tell of the situation that Mr. Shaw and myself, find ourselves in at present.

This ship was built in 1928 by B. H. Pietenpol and has well over 600 hours on it, 80 of which I have logged on her this summer past. I have been flying Pietenpol ships with Model A motors for six years and have had of 300 hours on these little ships. A more rugged staunch true ship never took the air than a Pietenpol.

I've been in all kinds of weather with them, landed in ploughed fields, corn fields and wheat so high that I could pluck the kernels from the cockpit when we rolled to a stop. And not once in my life have I ever had the least sign of strain or breakage on these ships. I have done spins, looped, did wing-overs, reversements and the falling-leaf with mine and never a complaint.

Always ready at the third turn of the prop to snap into action and deliver hours of economical dependable operation. I could write volumes of my experience with these little thoroughbreds but will spare that unless you ask for it. I also have a hangar for my ship that I built complete for $48.00 and will send you a photo as soon as I have one taken.

We go about our own flying, bothering no one, buying our own gas, keepi..g up our ships and then comes the state, saying, "you can't fly them any more, they are unsafe and not dependable."

Not many modern air-cooled motors are still kicking out their h.p. after 600 hours of operation, with the same rods, pistons and crankshaft. I find the Ford Model "A" good for 200 or more hours with nothing more than a valve grind at the end of this time.

These newspaper clippings tell their side of it, but there are two sides to this story. Yes, I plead guilty to their charge the first time because I was told if I would plead

(*Concluded on page* 134)

The Kinner R-5 Series 2 Engine

THE Kinner R-5 Series 2 engine is a five-cylinder static air-cooled engine similar to the well-known Kinner K-5, B-5 and R-5 engines. Bore 5 inches, stroke 5½ inches, piston displacement 540 cubic inches. This engine develops 160 horsepower at 1850 r.p.m., weighs 325 pounds, giving a specific weight of approximately two pounds per horsepower.

The head has approximately three times as much cooling fin area as previously used cylinder heads, having longer fins spaced closer together. A greater angle between inlet and exhaust valves results in a stronger head and provides additional metal between valve seats. Cylinder heads have rear exhaust ports and lugs are provided for support of cowling rings.

Enlarged intake passages and valves increase the efficiency and result in higher brake mean effective pressure.

Bearings have been increased in size. The crankshaft has been greatly strengthened by increased sections. The main and master rod bearings are of the copper lead steel-backed type. Master-rod sections have been enlarged and design altered to give a very much stronger rod with little increase in weight. Improved front cover provides additional strength and durability. All oil passages are contained in the engine.

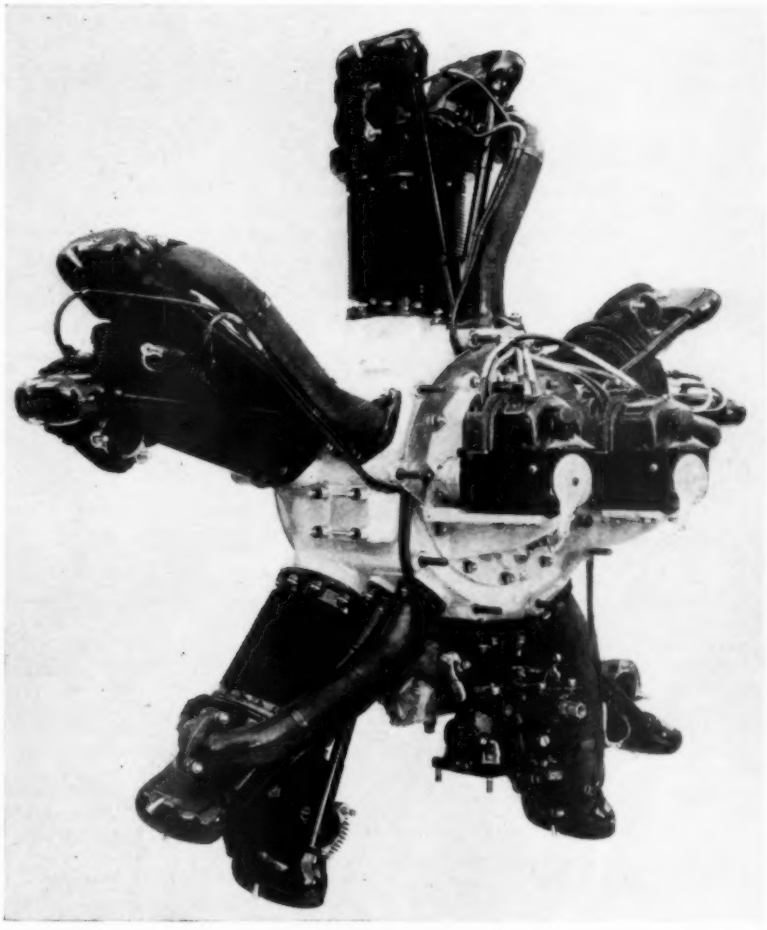
Rocker arms have a roller supported on needle bearings on valve end which reduces side thrust on valve and increases life of valve guides. High pressure grease lubrication is provided for the main roller bearing of the rocker arm and the rocker arm end of push rods. Push rod rocker arm adjusting screws are designed so that with their removal the push rod can be withdrawn through the opening of the rocker arm for inspection.

This new engine is one of the smoothest and most efficient in its horsepower class. Smoothness is accomplished by careful balance and proper distribution of weight in rotating and reciprocating parts. Its clean design, accessibility for servicing, and economy of operation make this the ideal engine.

The R-5 adheres to the characteristic Kinner design in employing a separate camshaft for each of the five cylinders, making possible a most efficient accessory drive arrangement. Each camshaft includes a simple spur gear driven by pinion gear on rear end of crankshaft at one-half engine speed.

Spur type magneto drive gears are driven by the cam gears. Oil pressure and scavenger pumps are driven by shafts keyed into slots in the ends numbers three and four camshafts, respectively. The benefit of Kinner simplicity in this respect is fully realized when overhauling the engine.

Provision for Eclipse compressed air starter and Eclipse Y150 direct electric starter, also generator and fuel pump drives are provided. Each accessory has its own mounting pad. Provision is made in oil sump for Cuno oil filter.



Rear elevation of Kinner R-5 radial air-cooled engine showing the accessories group and mountings.

A careful inspection of the accompanying photograph will show that all of the accessory group are neatly arranged in a compact and accessible fashion, well encased to guard against the entrance of dust and the exit of oil. This is made possible by the employment of separate camshafts for each of the cylinders.

Again, it will be noted that the cooling-ribs on the cylinder extend the full length of the barrel and, up to the cylinder head, are of uniform diameter. This should considerably reduce the parasitic drag over the old method of using tapered rib diameters. The valve mechanism is well protected and adequately ribbed for cooling, by well thought out directional air control.

This engine may be equipped with battery ignition at slight additional cost. Two machine gun synchronizing drives can be supplied on special order.

SPECIFICATIONS

Rated horsepower	160
Rated r.p.m.	1850
Type of Engine	Air Cooled Radial
Number of Cylinders	5
Bore	5 inches
Stroke	5½ inches
Displacement of engine, 540 cubic inches	
Compression Ratio	5.5 to 1
Ignition	Two Scintilla Magnetos
Carburetor	Stromberg NA-R6.
Crankshaft Propeller End	No. 1 SAE Standard
Engine weight dry without propeller hub, air heater, exhaust collector ring, starter, generator and fuel pump	325 pounds
Weight of rear collector ring including air heater valve	17 pounds

What Our Readers Are Building

Many of our readers are active amateur pilots and builders of practical planes. It is a great pleasure to us and of interest to our other readers, to show the excellence of these small planes, gliders and engines that have been built under many difficulties by real air fans.

Jim Haun's "Doolallee" from Tennessee.

Eberwine's Nifty Air-Camper.

C. B. Stone's "Hybrid" from Toledo, O.

A second peep at the Eberwine Air-Camper.

WE HOPE, from the bottom of our hearts, that some of our anti-light aircraft critics will just take a look at some of these jobs. And then read about what they can do. This should set to rest any false ideas regarding the inability of amateur aircraft builders to turn out good lightplanes.

Heading the procession comes the "Doolallee," built by Jim Haun, Memphis, Tenn. It is powered with a Heath converted Henderson that pushes it along at a top speed of 80 m.p.h. and which hauls it up to 1,000 feet in five minutes. The empty weight is 270 pounds and it takes off in about 100 feet.

The ship is built up in the usual manner with a bolted and riveted steel tubing fuselage and a wood wing structure. This construction has proved very strong after repeated landings in very rough fields. The wing has a Clark "Y" section which has also proved perfectly satisfactory in point of efficiency and stable performance.

Mr. Haun says that it is very maneuverable and sensitive to the controls and, while he has never stunted the ship, he has put it through stalls, slips and verticals with no tendency on its part to spin. Further, it does not vibrate in a fast dive as many lightplanes do.

Our next entry is by D. M. Eberwine, 427 Michigan Ave., Monroe, Mich., who enters a fine looking Pietenpol Air-Camper. On its first test flight, by Lieut. LeGrande Mercure, it flew "hands off" without making any rigging changes. During the same day, five 15-minute hops were made. It should be particularly noted that the Ford engine provides plenty of reserve power for, after take-off, the engine is normally throttled back to 1,500 r.p.m., although it turns up at a maximum of 1,800 r.p.m. with full open throttle.

Since the first flights were made, the Ford engine has been provided with an aluminum cylinder-head which decreases the weight and adds considerably to the power. The builder, a beginner in aircraft construction, was fortunate to build it under the supervision of Lieut. Mercure, who is a licensed mechanic as well as a licensed pilot.

And now we have what might be called a "hybrid," or a cross between a Heath Parasol and a Pietenpol Air-Camper. This most interesting combination was built by C. B. Stone, 1305 Cherry St., Toledo, Ohio.

The fuselage, back of the rear cockpit, is a part of a Heath bolted wire job that was built about three years prior to the construction of the present plane. The landing-gear and the center-section were designed by Mr. Stone. The radiator was taken from one bank of a Hisso engine, so we have a little wartime stuff mixed in for good measure. It is quite

and Their Progress in Aviation

a fast job with a top speed of 85 m.p.h., cruises at 70 m.p.h. and lands at approximately 40 m.p.h.

Jay Buxton, Hawthorne, Calif., obliges us by sending in a photo of his power-glider which has many interesting points. It shows good performance as an airplane with the motor and good performance as a glider without the motor. The motor cabane is completely removed and replaced by a plain cabane when used for gliding.

To make matters still more interesting, the motor is of the two-cycle type, an in-line inverted engine that is of unique design. This is a 3-cylinder, 3-port engine weighing 115 pounds, that develops 35 h.p. at 2,100 r.p.m. This gives the ship a top speed of 85 m.p.h. and a cruising speed of 75 m.p.h., at an expenditure of 2.5 gallons of gasoline per hour.

The wings have an area of 255 square feet and a span of 53 feet. The gross weight with pilot, passenger and 12 gallons of gas is 965 pounds.

In the January issue, we showed photographs of an English powered glider with a retractable engine, but Mr. Buxton has beat this glider by at least one good long year. Of course, the Buxton glider does not actually retract, but the principle of a with-and-without motor is essentially the same in both cases.

You will see the "Flying Flea" also represented here, to which we have given space for an entire detailed story in another part of this issue. This is an unusually fine job because the builder is an old-timer in the game, a transport pilot with several thousand hours to his credit, and was possessed of all the facilities for producing this little ship. It is powered with a "Scorpion" engine that is much larger than the engine ordinarily used.

Whether the "Flying Flea" is suitable as a training plane, only time will tell, because the Flea has entirely different control arrangement with the familiar rudder pedals entirely lacking. And you all know what an important part the rudder plays in a standard type plane. If a student should learn to fly a Flea perfectly, it is doubtful whether this preliminary training would do him much good.

Jack Rose, of the Rose Aeroplane and Motor Company, now has five completed Parakeets on the line, and is getting ready for a second edition of twenty more. Business is booming at the Rose plant and the speedy little single-seaters are going over in a big way with the public.

Jack Rose started as an amateur and is getting up to big time production, hence this news is of interest to all aspiring amateurs. The A. T. C. has recently been granted on the Parakeet, so the only thing left to worry about is to build enough of them.

Fred Smith shows a neat looking midwing monoplane that recalls the Italian Breda in general outline.

This is another view of the Cincinnati "Flying Flea" that we find described in detail elsewhere in this issue. The queerest thing about this plane is the wing curvature that serves as the dihedral angle.

This is Jay Buxton's power-glider with a two-cycle engine and other novel points. It still flies with or without the kicker and that's something that a lot of the big ships can't get away with.

New Instructors at Curtiss-Wright Tech

Herbert Rawdon, new engineering instructor at Curtiss-Wright Technical Institute.

HERBERT RAWDON, formerly chief engineer for the Travel Air Airplane Manufacturing Company, Wichita, Kansas, has been added to the faculty of the engineering school of the Curtiss-Wright Technical Institute of Aeronautics, Grand Central Air Terminal, Glendale, California.

This is the second addition that has been made in the faculty of the Institute during the last few months. The other new instructor is Nelson Grace, specialist in aircraft metal fabrication, who was added to the staff during the latter part of 1934.

Rawdon is a graduate engineer having an additional two years post-graduate work in administration and engineering to his credit. Starting work in the shops of the Travel Air factory in 1925, he was rapidly promoted through the shops and

(*Concluded on page* 148)

Nelson Grace, specialist in Sheet-metal fabrication at Curtiss-Wright Technical Institute.

Strange as It May Seem—by John Hix

SOME very interesting facts, concerned with aviation, are illustrated in the accompanying drawing by John Hix, the well known artist and originator of educational feature strips.

Particularly of interest is this famous old barn that stands on the eastern divide, so located that the natural drainage is toward the Atlantic on the northeast and the Gulf of Mexico to the southwest.

Again, there is no need for a map when flying over the State of Iowa in a United Air Lines plane at an altitude of 10,000 feet, for from this vantage point you can see the entire state to its farthest borders. This would be impossible with Illinois, at least along a north and south line, for Illinois is very long and narrow while Iowa is nearly square.

In point of length, Honolulu is by far the largest city in the world for it extends, officially, for a distance of 2,200 miles. It is considerably more than twice as far across Honolulu than the distance from Chicago to New York.

As a matter of fact, the whole of Honolulu is longer than some of the stretches flown by the "China Clipper" on its recent trans-Pacific cruise so that this will give one an idea of the magnitude of these islands that form the mid-Pacific possessions of the United States. This is a trans-city flight that means something.

YOU CAN FLY FROM NEW YORK TO CHICAGO ON UNITED AIR LINES IN FAR LESS TIME THAN YOU CAN FLY ACROSS THE CITY OF HONOLULU...
HONOLULU IS 2200 MILES ACROSS
MOUNT LASSEN - in California - IS THE ONLY ACTIVE VOLCANO IN THE UNITED STATES.... IT LIES EAST OF UNITED'S SAN FRANCISCO - SEATTLE ROUTE
THE WHOLE STATE OF IOWA IS VISIBLE FROM A HEIGHT OF 10,000 FEET IN A UNITED PLANE...
ON THIS OLD BARN IN OHIO - ON THE CHICAGO-NEW YORK AIRWAY... THE RAIN THAT FALLS ON ONE SIDE OF THE ROOF FLOWS INTO THE ATLANTIC... WHILE THE RAIN THAT FALLS ON THE OTHER EMPTIES INTO THE GULF OF MEXICO

Soaring for the Movies

by "SPEED" WESTPHAL

"Speed" gives us a mighty interesting story of his experiences in gliding for the movies, during which time he broke the California record for distance. You'll enjoy every word and profit a lot by reading this article by a gliding expert.

THIS article marks the first anniversary of the National Glider Movement and I am happy to look back and see what it has done in the way of bringing back gliding and soaring.

Last February, when I first wrote, "Where Are the Glider Clubs," I was sure that the game was far from being dead. Today, as I study the thousands of fine letters which have reached my desk during the past year, I feel assured that something has really been accomplished.

According to my records, there has been formed under this movement, fifty-one active glider clubs. If you have read my last article you know of the other results.

I can only thank all of you who have been kind enough to write me concerning the activities in your locality and will continue to aid all of you other fellows as much as possible.

I have received many letters which I was unable to answer due to the correspondent neglecting to enclose his name and address. It even went so far that I received a letter post-marked Davenport, Iowa, starting out with "Dear Milly . . . I've told you a hundred times, etc., etc." It was signed "Bob."

I will admit that I tried everything but bloodhounds to run down the writer of this letter. Not because I was interested aeronautically, but I would have liked to have him write a few personals for yours truly. He sure knew his stuff and most certainly was floating on air, glider or no glider.

In the past two issues of POPULAR AVIATION, I described a few of the U. S. soaring sites. Since then, I have been doing some soaring at what I believe to be the best site in this country. Because I feel sure that some of the National records will fall before us during this year, I will do my best to give you as much detail as possible in my limited space.

The ridge was first discovered by four California boys, namely, Melvin Smith, Gus Briegleb, Don Walters and Fred Francis. The take-off point is 5,600 feet above sea-level and 3,600 feet above Cherry Valley. From this point, the ridge runs almost straight west to the coast-line, which is approximately 125 miles distant. Another ridge connecting this one, turns slightly north and runs as far as San Francisco, 400 miles away.

The valley floor, directly in front of our take-off point, is about fifty miles across and perfectly flat. Just to the rear of our launching hill is one of the highest peaks in the U. S. This is shown on the maps as "Grey Back" mountain and is 11,000 feet above sea-level.

There are three very good reasons for our continued soaring activities at this point, known as Pilsner peak. First, is the fact that, by picking up the tail of the glider and turning it about, we can take off into almost any wind direction. Any type of launching is possible and one may easily land back on the top. The second point is that there are very nice gravel roads leading right to the top of the ridge.

Last, but by no means least, is the very fine apple ranch and lodge located halfway up the mountain. Owned and operated by Mr. I. Ford and his two sisters, the Oak Glen lodge is large enough to accommodate some eighty guests, including private rooms, large dining rooms, club rooms and everything else that goes to make staying in the mountains a pleasure. Thousands of boxes of apples are sent from this ranch yearly to all parts of the World.

At the time of this writing, we have had very little time to do any extensive experimenting, due to the fact that all of us have been working day and night on a moving picture for the M. G. M. studios, which incidentally will show you what the site looks like. The picture, which is entirely concerned with gliding, will be released under the title of a "Pete Smith Short" and entitled "Air-Minded."

After doing four days of the most thrilling glider flying I have ever attempted, including jumping two hurdles, hitting a hay pile, vertical banks ten feet

Courtesy M-G-M Studios

Jay Buxton's 2-place soaring plane with the Metro-Goldwyn-Mayer camera ready for taking air-shots, Oak Glen, Calif.

Courtesy M-G-M Studios

"Speed" Westphal making a landing on a hay-pile for a scene in "Air-Minded." This is the new Briegleb combination glider and lightplane (A.T.C.).

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above the ground, zooming and diving a few inches above the shark-infested sea and a dozen other stunts, the entire company of producers, cameramen, propmen, mechanics and pilots moved their ships and equipment to the above mentioned mountain top.

Now, just in case you don't know it, the production figures of such a picture run about one thousand dollars per day and at this rate one doesn't just sit around waiting for a wind to spring up and blow the ears off of the director's otherwise even featured face.

So, on the morning of the first day, the most beautiful sunrise I have ever witnessed showered its cheerful glow (I copied this part from the studio script) on the dew-covered wings of four giant mechanical birds (gliders to youse mugs).

First in line was a "Franklin Utility," flown by "Don" Stevens. Directly behind this ship was the new "Briegleb Utility" which later proved itself such a fine soarer. Third in line a two-place ship built by Jay Buxton and flown by Fred Barnes.

The last glider had been left on the trailer during the night and, while "Don" was getting ready for the first take-off, the fourth ship was being rigged by its owner and pilot, Franklin Wolcott. The other glider, which you will see in the picture, is known as the "Kingfish" and was built and flown by the Hall Brothers, Eugene and Stanley.

With cameras clicking and Director Boyle yelling out the movements of the script, which was written by Mr. Goldstone and Mr. Briegleb (with gags by yours truly), the first ship was launched into space directly over the none too hairy head of our chief cameraman, Les White.

With insufficient wind to maintain or gain altitude, "Don" was forced to be satisfied with a zigzag flight to the valley. The two-place ship was next to leave the ridge with Fred Barnes at the controls. Having better luck than Don had, Fred was on his way for a new two-place record for the West Coast. His distance was figured at 11 miles. Several minutes after this launching, I was shot off the ridge.

During the first few minutes, I believed that I was also on my way to the valley, however, looking over to my right, I caught a glimpse of a hawk which was apparently riding a thermal, so I headed in his direction. When I could see him directly above me, my variometer began doing tricks and I started a slow flat turn to the left.

Within 45 seconds I had gained 500-feet by my altimeter and was now on the same level with the inquisitive hawk who seemed quite put out by my thermal stealing. From this point I started out over the valley toward the field in which the two-place ship was going to land. This is located about 10-air-miles from the ridge.

Much to my surprise, I found that by the time I arrived over this field I was

(*Concluded on page* 147)

The New Curtiss-Wright "Sparrow"

by BURTON KEMP

Three-quarter front view of the Curtiss-Wright "Sparrow."

PLANES for the masses, meaning air-fans with limited spending money, have appeared in flocks this year and, to all appearances, the masses will all be up in the air next season if present developments mean anything.

We have had stories about the Plymacoupe, the Hammond "Y," Weick W-1-A and the Waterman Arrowplane, all of which are under development, but little has been said, so far, about the new all-metal Curtiss-Wright "Sparrow" which, at present, is undergoing its factory tests before being delivered to the Bureau of Air Commerce for further tests.

The "Sparrow" is certainly a fine looking little ship, greatly resembling the Northrop planes in both appearance and construction. It is a 2-place job with side-by-side seating of the most comfortable and practical type, and powered by a Lambert R-266 engine developing 90 horsepower. It has a smooth-skin metal covering applied over an all-metal frame.

A Curtiss A-12 Caught in the Act

HERE'S A Curtiss A-12 Attack plane, caught in the act of laying its eggs near Barksdale Field, Louisiana. This is really a most remarkable shot since the bombs are shown very clearly and sharply even though they are traveling at a high rate of speed.

They have been so recently released, in fact, that they are still pointing in the direction of flight and have not yet had time to nose down in their normal vertical position.

The Curtiss A-12 Attack plane is reputed to have a speed of 200 m.p.h. and an armament consisting of five machine-guns and a big load of bombs. Its purpose is to attack the land forces of the enemy.

When these falling bombs reach their objective, there is bound to be a big atmospheric disturbance at the other end of the trip.

Airplane Fuel Requirements

by S. R. WINTERS

We have here, the latest method of computing the fuel requirements and cruising radius of an airplane in which computations have been very much simplified. We wish to thank the National Advisory Committee on Aeronautics for the tables.

WHETHER the plane be a warship carrying bombs, a trail-blazer of the skies seeking a record, or simply a commercial passenger plane, naturally it is of equal importance to know the amount of fuel required to cover a certain distance.

However, when we single out the case of the bombing-plane, where the object is to carry a maximum bombing load and at the same time a sufficient quantity of fuel for the flight and return, it is easy to see a necessity for knowing in greater detail the relation between the fuel-load and useful-load.

In making such an estimate, we must take into consideration the facts that a machine can fly high or low, at maximum speed or at most economical speed, or at most economical power consumption. Though the conditions described in the following study relate to a bombing load, naturally they apply equally to any ordinary commercial purpose. The data are on an 800-horsepower, 15,000-pound bombing machine, but the method is applicable (with slight variations) to any machine.

In Table No. 1, are given the essential data for the specific machine used in the calculations. The total wing and parasite resistances were computed for assumed total weights of 15,000, 13,000, 11,000, 9,000 and 7,000 pounds, respectively. The total resistance and horsepower curves were then plotted against speed in the usual way.

The work required to fly a certain distance is the product of the total resistance (or required propeller thrust) and the distance, and the least work is required when the thrust is kept at its minimum values. Therefore, the points of minimum drag are allocated with respect to the resistance curves. Points located hereon showed what speeds were most economical and their corresponding power requisites.

Powers, thus determined, are not the minimum powers. The minimum powers occur at speeds slightly less than minimum resistance speeds and are a little less than those corresponding to minimum resistance.

It is somewhat surprising to learn that the minimum power is that for which the fuel consumption is least for a given time and yet is not the most economical power for flying the greatest distance. A plane having the object to stay aloft the greatest possible time should fly at the speed corresponding to minimum power.

The following facts have been determined from a table in which the weight of the machine is plotted against minimum distance and from another table showing the effect of variation of weight

*TABLE 1. SUMMARY OF TOTAL RESISTANCES FOR A MACHINE WITH A VARIABLE LOAD. AREA OF WING = 1,875 SQUARE FEET

Weight and wing loading	Speed in M.P.H.	Monoplane Kyx10⁴	Biplane Ky = .85 mono Kyx10⁴	Monoplane Ky/Kx	Biplane Ky/Kx = .85 mono Ky/Kx	Wing Resistance = W/Bip (L/D)	Parasite Resistance x1.10	Total Resistance wing + parasite	Required horse-power
						Pounds	Pounds	Pounds	
15,000 pounds or 8 pounds per square foot.....	70.0	19.2	16.3	16.2	13.8	1,090	609	1,699	318
	80.0	14.9	12.5	21.2	18.0	834	735	1,569	334
	90.0	11.6	9.9	21.7	18.4	814	937	1,751	421
	100.0	9.40	8.0	19.6	16.7	899	1,151	2,050	547
	110.0	7.88	6.6	16.8	14.3	1,050	1,400	2,450	719
13,000 pounds or 6.92 pounds per square foot..	60.0	22.6	19.2	9.3	7.9	1,643	475	2,118	339
	70.0	16.6	14.1	19.8	16.8	773	609	1,382	258
	80.0	12.7	10.8	21.8	18.5	702	735	1,437	306
	90.0	10.0	8.55	20.5	17.4	748	937	1,686	404
	100.0	8.15	6.91	17.3	14.7	884	1,151	2,035	543
	110.0	6.72	5.71	15.0	12.7	1,022	1,400	2,422	710
11,000 pounds or 5.86 pounds per square foot..	60.0	19.2	16.3	16.2	13.8	801	475	1,276	204
	70.0	14.1	12.0	21.5	18.3	602	609	1,211	226
	80.0	10.75	9.15	21.3	18.1	608	735	1,343	286
	90.0	8.48	7.23	18.2	15.5	712	937	1,649	396
	100.0	6.90	5.86	15.2	12.9	854	1,151	2,006	535
	110.0	5.70	4.84	13.0	11.1	996	1,400	2,396	702
9,000 pounds or 4.80 pounds per square foot..	50.0	22.6	19.2	9.2	7.8	1,152	365	1,517	202
	60.0	15.7	13.3	20.6	17.5	515	475	990	158
	70.0	11.5	9.79	21.6	18.4	491	609	1,100	206
	80.0	8.82	7.50	18.6	15.8	570	735	1,305	278
	90.0	6.97	5.92	15.4	13.1	686	937	1,623	390
	100.0	5.66	4.80	13.0	11.1	815	1,151	1,966	524
	110.0	4.68	3.97	11.2	9.5	946	1,400	2,346	689
7,000 pounds or 3.74 pounds per square foot..	42.7	24.0	20.4	6.6	5.6	1,250	270	1,520	173
	50.0	17.6	14.9	18.8	16.0	439	365	804	107
	60.0	12.3	10.4	21.8	18.5	378	475	853	136
	70.0	9.02	7.65	19.2	16.3	429	609	1,038	194
	80.0	6.85	5.84	15.1	12.8	547	735	1,082	274
	90.0	5.44	4.62	12.5	10.6	660	937	1,597	383
	100.0	4.41	3.74	10.6	9.0	777	1,151	1,928	514
	110.0	3.64	3.09	8.4	7.1	981	1,400	2,381	698

*By courtesy of National Advisory Committee for Aeronautics.

XUM

of the total resistance and required horsepower.

1. The maximum range speeds decrease in accordance with the decrease of the load; a plane must fly slower as the load diminishes.
2. The maximum range powers decrease with the decrease of the load.
3. These powers are not minimum powers but are slightly greater and correspond to greater speeds than least power speeds.
4. Total air resistances decrease almost in exact proportion to the weight of the plane.

In compiling information on fuel consumption, experimental tests were made to further ascertain the following facts: Fuel consumption at maximum brake horsepower output is taken as 0.6 pound per horsepower hour, and for any reasonable throttled conditions this number is set at 0.7.

The available horsepower curve was found in the usual way by assuming proper propeller efficiencies at slow and high speeds and multiplying these into the available brake horsepower.

To compute the fuel consumption per horsepower delivered by the propeller we divide the fuel consumption per brake horsepower of the motor by the propeller efficiency at that speed, or to put it in figures, multiply 0.6 by 800 and divide by the available horsepower at that speed.

The results are then multiplied by $\frac{0.7}{0.6}$ to justify the slight loss of efficiency under throttled conditions. Table 2, shown below, is based on this data, and we see that fuel consumption has a direct proportion to the weight.

We must remember, too, that a plane starts on a flight with the speed, gas consumption and thrust according to its total weight, but as it advances flies at new values corresponding to the new weight which is equal to the old weight less the fuel consumed thus far.

We find the maximum possible range to be 2,480 miles under such conditions. Sometimes a return trip is to be made without refueling. The weight-distance curve below shows the greatest possible useful load.

The figure above shows that we have set 600 miles as the distance to be covered. AB-CD pounds of fuel are needed to get there and after the load is deposited it requires GF pounds to get back. Since the maximum load is AB pounds, the useful load will be DE or D'E' pounds or that which is left.

Calling the maximum range S, project the points on the curve for s = 600, point D, and s = S—600, point F, on the weight axis, the weight included between these two points is the maximum load of that objective.

The load decreases to zero as the objective distance increases to half the maximum range and increases to the maximum load as the objective distance decreases to zero. A curve plotted by this method to show the maximum use-

(*Concluded on page* 138)

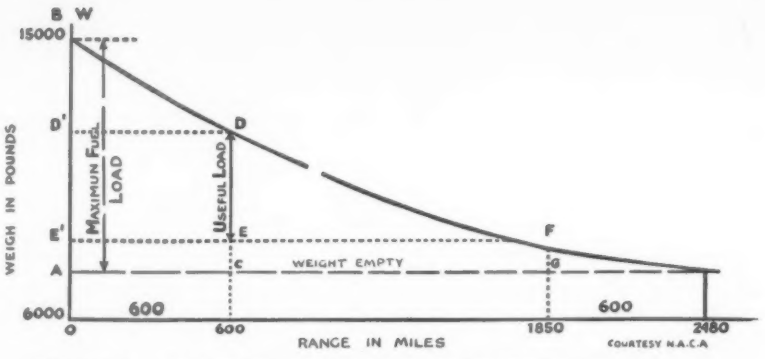


*TABLE 2. GAS CONSUMPTION IN POUNDS PER HOUR AT THE ECONOMICAL SPEED

Weight of machine	Minimum total resistance	L/D or weight/tot. res.	Corresponding speed in miles per hour	Corresponding horsepower		Gasoline consumption, 0.7x800 avail.H.P. in pounds/per horsepower	Total gasoline consumption per hour
				Required	Available		
Pounds	Pounds						Pounds
15,000	1,560	9.62	77.5	320	603	0.927	296
13,000	1,372	9.47	72.5	265	583	.960	254
11,000	1,195	9.22	66.7	212	555	1.009	214
9,000	992	9.08	59.6	159	517	1.082	172
7,000	795	8.82	52.5	107	472	1.187	127

*Courtesy N. A. C. A.

*TABLE 2 a. GAS CONSUMPTION IN POUNDS PER HOUR AT THE MAXIMUM SPEED

Weight of machine	Minimum total resistance	L/D or weight/tot. res.	Corresponding speed in miles per hour	Corresponding horsepower		Gasoline consumption, 0.6x800 avail.H.P. in pounds/per horsepower	Total gasoline consumption per hour
				Required	Available		
Pounds	Pounds						Pounds
15,000	2,265	6.63	105.4	636.0	636.0	0.755	480
13,000	2,260	5.75	105.9	635.5	635.5	.755	480
11,000	2,245	4.91	106.3	635.0	635.0	.756	480
9,000	2,225	4.05	106.8	634.9	635.9	.756	480
7,000	2,225	3.15	106.8	634.8	635.9	.756	480

*Courtesy of N. A. C. A.

*TABLE 2 b. RATIOS OF L/D AND ANGLES OF INCIDENCE FOR MAXIMUM RANGE

MAXIMUM RANGE SPEEDS

Loading pds./sq. ft.	Biplane L/D	Velocity miles per hour	Biplane Kyx10⁴	Monoplane Kyx10⁴	Angle of incidence degrees
8.00	15.55	77.5	13.3	15.65	5.3
6.92	15.63	72.5	13.2	15.55	5.2
5.86	15.63	66.7	13.15	15.50	5.2
4.80	15.38	59.6	13.5	15.90	5.45
3.74	15.30	52.5	13.55	15.95	5.5

HIGH SPEED

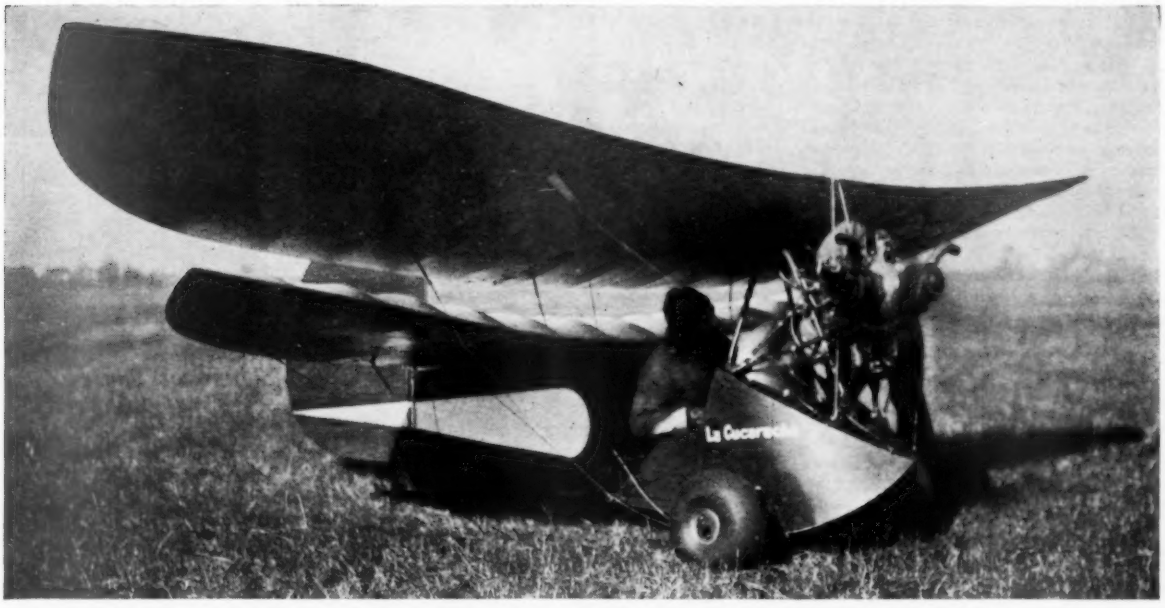
Loading pds./sq. ft.	Biplane L/D	Velocity miles per hour	Biplane Kyx10⁴	Monoplane Kyx10⁴	Angle of incidence degrees
8.00	14.45	105.4	7.15	8.41	1.75
6.92	13.17	105.9	6.18	7.27	1.25
5.86	11.65	106.3	5.17	6.07	0.7
4.80	10.03	106.8	4.21	4.95	.2
3.74	3.06	106.8	3.28	3.86	−.35

*Courtesy of N. A. C. A.

The Itch for a Flying Flea

by ED NIRMAIER

At last it has been accomplished. An American constructor has succeeded in building a Flying Flea that flies—and flies well. Here is all the dope and the pictures, so let's get started reading this interesting true story.



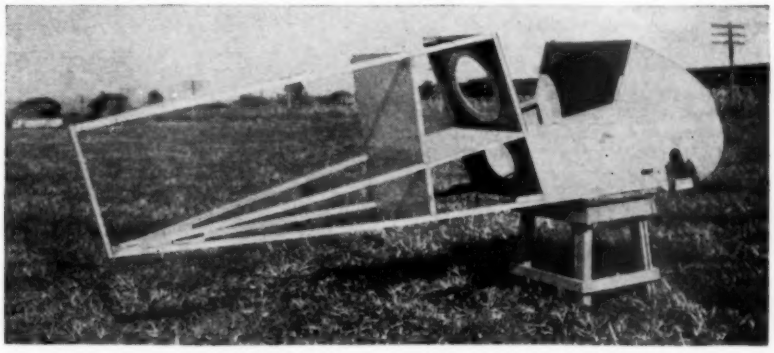
Here's a front view of "La Cucarncha", the American edition of the "Flying Flea", with Ed Nirmaier, the builder, at the controls.

WE, my mechanic and myself, built a Flying Flea in about four weeks. I have spent, to date, about $75.00 but I had the steel tubing, sheet steel, spruce, engine and propeller already on hand so this must be considered. However, I estimate that all the necessary materials could be purchased under $100.00 with the exception, of course, of the engine and prop.

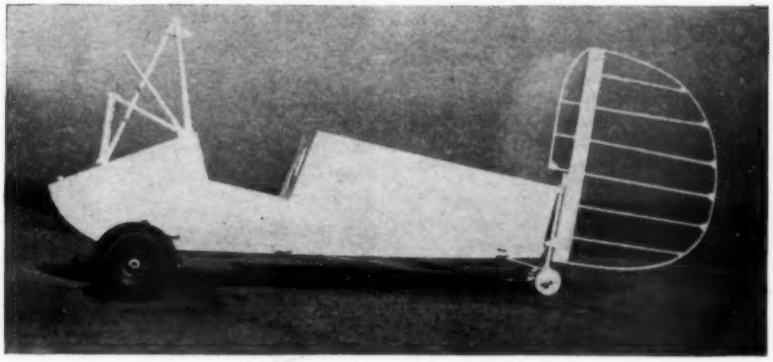
I must confess that I am not a beginner in aviation, for my flying time to date is 6,480 air-hours with 19 years of continuous flight experience. I am now, and have been for four years, Powell Crosley's personal pilot and fly his Northrop Delta, Douglas Dolphin and a cabin Waco. Therefore, this Flying Flea is hardly an amateur job and I wish to call your attention to this fact. So far, I have never cracked a plane and I'm hoping that I can still say this after I have finished with the Flying Flea.

My Flying Flea has plenty of reserve power since it is equipped with an A.B.C. 35 h.p. "Scorpion" engine while the design only calls for 20 h.p I have much more power than I actually require and, as a matter of fact, I haven't given her the full gun yet because I don't wish to pull the wings off.

This little ship flies very well. The top speed, so far, has been limited to 80 m.p.h. because I don't wish to unnecessarily stress her, but I believe that it will do considerably better than this



This is the way that the fuselage is framed. Certainly simple enough for almost anyone to build.



One more step in the progress of the life story of a Flying Flea. The fuselage is covered, the wheels and tail group are in place and she is ready for covering.

with safety. The cruising speed is about 70 m.p.h. while the landing and take-off speed are not more than 30 m.p.h. In still air, she will come to rest in about 150 feet and take-off inside of 200 feet.

After a few test-hops and adjustments of the main front wing, the wing was finally located at the proper balancing point and it now flies remarkably well. It holds a peculiar attitude for the fuselage does not change its angle with the ground to any extent, but always remains horizontal, either in a take-off, landing, climb or glide. In rough air the little ship rights itself without any assistance from the pilot which is certainly an advantage for the beginner.

Frankly, I don't believe that the Flying Flea should be stuck together by a lot of boys, or raw amateurs, who would be compelled to guess at the rather critical adjustments. On the other hand, it does not require the services of an engineer. I am no engineer myself, but I have had a lot of practical experience around aircraft, both in civil life and during my sixteen years in the navy and, besides, we have had a good shop to build it in with plenty of equipment. However, in the hands of a fairly good pilot or a good amateur builder, building should be a fairly easy task.

And another confession. As an airplane, this ship did not interest me in the least, although I got a certain amount of kick out of it as I did out of my first Aeronca. However, I believe that it will appeal to many young fellows and possibly girls, who are on the outlook for low cost flying.

The designer claims that you should be able to teach yourself to fly on it, but about this I can't say. I am in the position of a swimmer who has had a lot of experience in swimming and therefore can't see why everyone cannot swim. But, with some coaching from a good pilot, I believe that the average young man or girl can learn to fly on it with a little patience and care.

There are some practical objections in the way of the universal application of the Flea to American practice. In the first place, some states prohibit the flying of identified ships. The next difficulty is a suitable light engine of low horsepower. Another would lie in getting the ship passed by the Department of Commerce.

So far as the details go, the ship is different from any now in use. There are no ailerons, only a very heavy dihedral angle for maintaining lateral balance. The stick controls both the incidence of the main wing, the rudder and the tail wheels, since the two tail wheels are attached directly to the rudder. Control in side-winds, on the ground, is positive but I certainly miss the rudder pedals in cases like this.

You will notice that the front view shows that one of the wheels is off. On this trip, I landed with a flat tire, but experienced no difficulty and did not even know that it was flat until it had come to a complete stop and until the bottom of the fuselage was on the ground. Am using Aeronca 16-inch wheels at present, but will change to 20x4 which give better performance.

While the angle of incidence of the front wing is variable, the incidence of the rear wing is fixed. There is always a slight pull on the stick because the center of lift is behind the spar or hinge point. The action between the rudder and dihedral is comparable to the rudder and aileron of the conventional type ship.

And now I am going to finish by answering, in advance, a question that I know is in your minds. What is the gas and oil consumption? Well, the mileage is easily 40 miles to the gallon which is better than flivver automobiles or almost any other vehicle except a motorcycle. With a gas tank capacity of 7 gallons, this should give her a range of 280 miles which is not bad at all, even for such a little outfit.

When we built the Flea, we were not the least bit careful with our weights, but built it heavily and substantially, using oversize material throughout. And even with this disregard of weight, the ship only weighs 316 pounds complete. If the normal engine were in place, a few more pounds would come off without weakening it, and the use of the proper material in place of the galvanized steel in the tank would also help some.

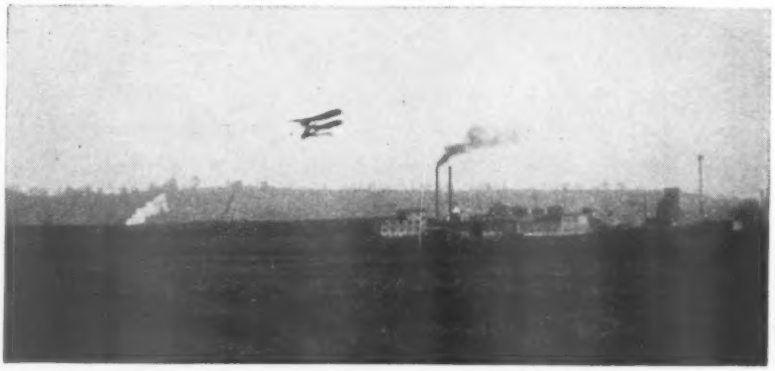
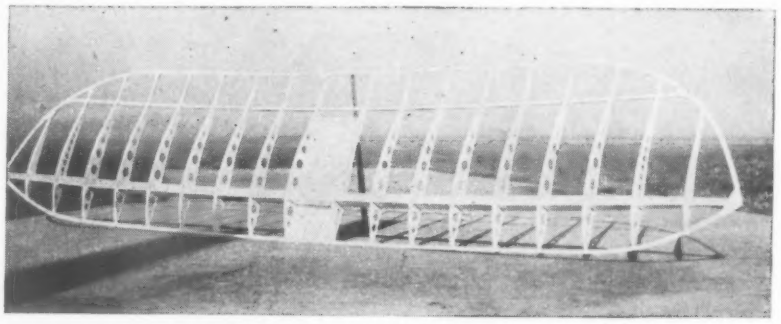


Fig. 3. Here she goes! The Flying Flea does her stuff as we can plainly see.



And this is the wing structure before covering. It would be hard to find anything simpler than this. Note the wing-tank in the center.

Details of the wing-tank, the spars and the ribs. This tank is partitioned for both oil and gas.

Building Model Aero Engines

By CLYDE R. GARL

This really marvelous operative 9-cylinder model was built by a high-school instructor. Read what he has to say about model engine construction.

A FRIEND called one evening to inspect my workshop and models. He asked, "What do you expect to run with this airplane engine?" I was at bay for an answer until I happened to remember my friend was an ardent stamp collector. Then I asked, "What are you going to do with your stamp collection when your book is filled?" He got the point.

After some discussion, we came to the conclusion that everyone should have some sort of hobby for spare moments, especially those that follow a certain daily routine.

A hobby, to be a recreation, must not be limited to a set schedule. Hours and time should be secondary while the pleasure of doing one's work well should be the objective of an ardent hobbiest—a model worker, in this case.

Too many people have the idea that model making is just passing the time, and that no real skill or knowledge is required, or acquired.

The six year old boy with his first model airplane, crude as it may be, acquires a great deal of knowledge in the use of tools and materials, besides the satisfaction of making something and pride in an accomplishment.

The adult with more education and experience may tackle more difficult projects. He should look at the model in a more technical light. On simple objects, the hit-and-miss method may take the place of drawing or plans with fair results, but on more elaborate projects, plans should be worked out in a craftmanlike manner. For instance, formulating ideas by means of sketches, then testing sketches with scale assembly drawings from which the details are made.

Highly mechanized projects, the airplane engine for example, require many drawings, including assemblies, details, gear trains and motion diagrams.

The model maker's shop need not be elaborate with many expensive machines. This entire engine that aroused my friend's question was made on a No. 3 watchmaker's lathe. The lathe is a basic machine for the workshop because it can be adapted to so many types of work.

On my lathe I have attachments for wood turning, metal turning, grinding, drilling, milling boring, buffing, drum and disk sanding. I believe it is better policy to invest a little more money and buy a good bench lathe than to buy a variety of cheaper machines.

I felt quite accomplished when I made my own casting, which completed the entire process from the design patterns, castings, to machining to the finished job.

A front view of the one-horsepower miniature radial airplane engine that contains 700 parts and took one year to build. This is certainly a most beautiful job.

A side view of the model radial engine which employs a distributer instead of a magneto. This is not simply a dummy model but actually runs.

Scrap aluminum can be obtained at automobile wrecking companies. The strength and weight of aluminum castings may be varied by selecting the proper scrap. For light work, sweeper parts, or automobile crankcases, may be melted; for harder casting, aluminum pistons and aluminum alloy are very good.

Aluminum melts at 1217 degrees and can be melted satisfactorily in the ordinary heating furnace with a heavy cast-iron ladle and a medium fire of coal in its coking stage.

Carefully study the following specifications in order to fully understand how small this engine really is, and to appreciate the great amount of work that has been spent on it.

Model Engine Specifications

Number of cylinders	9
Bore of cyls.	1"
Stroke of cylinders	1⅛"
Displacement	7.92 cu. in.
Compression ratio	5:1
Overall diameter	10½"
Firing order	1-3-5-7-9-2-4-6-8.
Crankshaft rotation	CLOCKWISE

A New Model Organization

AVIATION POST NO. 651, of The American Legion, now has a Junior Birdmen of America Squadron made up of the daughters and sons of the post members. The unit is known as Aviation Post Squadron No. 1270, and is being directed by Joseph J. Lucas, noted model airplane expert and national model champion.

The officers of this squadron are:
Commander Joseph J. Lucas, Jr.
Major H. Hudson Woeltjen.
Sergeant-at-Arms Charles Stuart Carmichael.

The charter members of this Squadron are as follows:

Joseph J. Lucas, Jr.	Martin McMahon, Jr.
Chas. Stuart Carmichael	H. Hudson Woeltjen
Robert Snyder	Kathryn Bamrick
Theodore Bjork	Josephine Murison
Gifford Rich	Jack Cosmer
Bernard Keegan, Jr	William Bunn
William Keegan	Alberta Bunn
Lawrence Keegan	Walter Daiber
Phillip Robinson	
Patricia Sweeney	

The officers have met on October 27, and arranged for a meeting, which took place on November 23 at the Hotel Sherman. At this Squadron meeting John Kusch, the 1935 National Champion of The Junior Birdmen of America, gave a talk on his trip to the West Coast, which he won as the Chicago Wing Champion, and winning the 1935 Championship in California.

His talk was of great interest and very educational. Another speaker at the November 23 meeting was Joseph J. Lucas, member and Secretary of the Executive Committee of Aviation Post, No. 651, of The American Legion, who gave a talk on "The History of Model Aviation and Its Scientific Value."

The members of the Squadron has also arranged for a Christmas Party during the last week of December with the Aviation Post members of the American Legion.

Aviation Post is sponsoring this Flight Squadron of this nationally wide organization of air minded boys and girls and Aviation Post members praise this youth movement as a very important step toward National Defense and also urge that other Legion Post and other organizations throughout the country to sponsor a flight squadron in the community they live.

The members of the Aviation Post Squadron are sons and daughters of some of the best known pilots in the country and these Junior Birdmen in this Squadron will be second generation Birdmen.

A Gas Model Q & A?

HOW would you like to have a gas-model Question and Answer Department in POPULAR AVIATION so that you can ask any question about the game that you wish and have it answered in these columns by members of the Central Gas Model Plane Society Well, write and tell us what you think.

Designing Gas Model Propellers

by P. J. SWEENEY

WHEN designing your gas-power propeller, it is necessary to understand that the maximum thrust will be obtained when a prop having a large diameter, low pitch is run at a moderate speed. This is also true, to a certain extent, with the large airplane propellers and accounts for the common practice of gearing down such propellers.

So far, as the gas-powered model is concerned, however, there is a second reason, aside from that of efficiency, for keeping the engine speed down within limits. This is to reduce the drain on the very small flash-light batteries used in the ignition system, because the faster the engine runs the more sparks will be required and the sooner the battery will become exhausted. Again, the fuel consumption with the two-cycle engine is excessive at very high speeds, for the two-cycle engine is inherently a slow-speed type.

Small pitch high-speed propellers are seen at many contests, but they are not desirable where the gas-consumption is limited by the contest rules. High speed is O. K. where only another flight is required, but to win out on the basis of the rules in many modern contests we must consider fuel consumption in addition to the several other factors.

The accompanying drawing was made from one of twelve props that were carved and tested with a model gas-motor. This particular prop proved to be the most efficient at a speed of 3,000 r.p.m., while the smaller propellers had to be run up to 4,200 r.p.m. to get any results, so that it is evident that there is quite a saving in batteries and gasoline when the accompanying propeller plan is used. The speed of the motor is primarily determined by the propeller, its diameter, pitch and speed.

Another difficulty is that due to "torque" which can be again traced back to an improperly designed propeller. The development of torque with the corresponding Chinese defect, "One-wing-low," has ruined the flying capabilities of many fine models.

The propeller must be "clean" from hub to tips, that is, must be perfectly smooth with flowing curves and no pockets. The tips must "track" and it must be perfectly balanced to avoid destructive vibration. An unbalanced prop can quickly rack the motor. When installing a new propeller, test it as you did on your first flight.

Start the motor slowly, let it idle, then increase the r.p.m. slowly and watch what happens. When you are satisfied, after a few tests, then you can let it fly. Always mark the timer in such a way that you can tell what to expect at different speeds.

CARVING THE PROPELLER

The following order of procedure is followed in carving a propeller. (1) Square up the block. (2) Find the center. (3) Drill a hole the size of the crankshaft. (4) Draw a circle around the hole equal to the size of the propeller washer. (5) Lay the block on the flat side and draw lines from tip to outside

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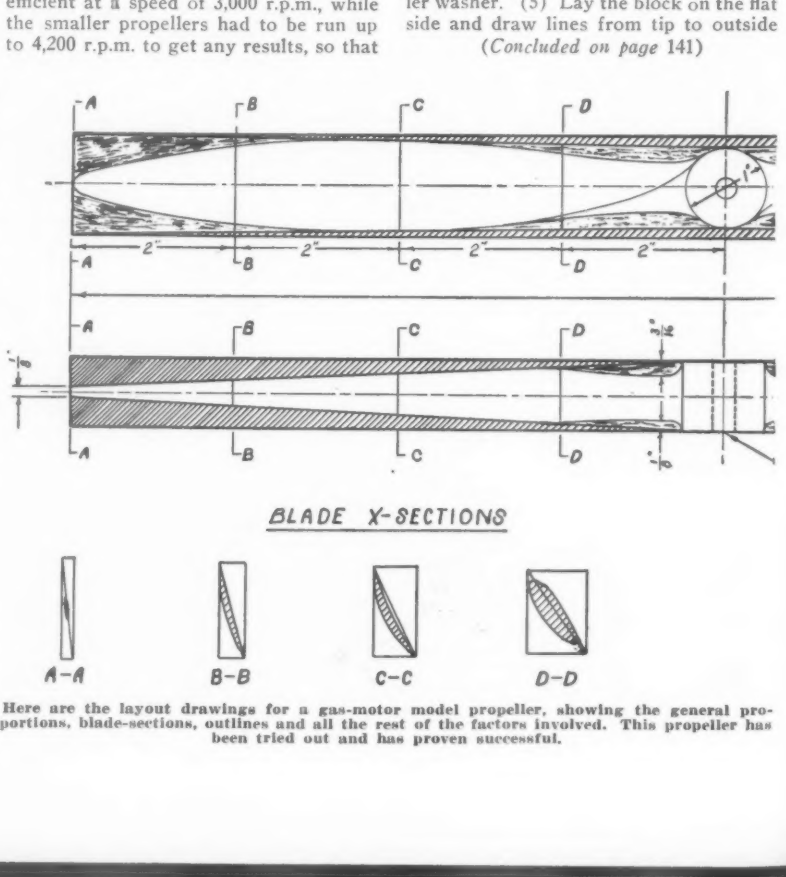


Here are the layout drawings for a gas-motor model propeller, showing the general proportions, blade-sections, outlines and all the rest of the factors involved. This propeller has been tried out and has proven successful.

A Record of Gas Model Contests

by JOSEPH A. NEIGEL

Interesting facts concerning the history of American contests for gas powered airplane models with notes on the maintenance of the models and various tricks of the trade in getting successful flights.

MANY of the model builders who attended the 1932 National Meet, held at Atlantic City, will remember the four foot gasoline model belonging to Maxwell B. Bassett.

Although it was not officially entered in the contest, it would have very easily placed with its flight of thirteen minutes duration. At that time, Bassett predicted that gas-powered models would soon take the place of the old rubber type powered models.

No one took this prophecy seriously, but he proved his statement with outdoor flights of twenty-eight, twenty-two, and fourteen minutes. He won every outdoor event at the 1933 National Meet held at Roosevelt Field, New York City. His only competitor was Joseph Kovel who, with a ship finished only the night before and a balky motor that absolutely refused to run, made no official flights.

In time, however, due to Bassett's success, many expert model builders and model clubs began to realize the possibilities of gas-powered models. The next meet held at Newark, New Jersey, saw four models on the field. Maxwell Bassett once more won with a flight of six minutes and Joe Kovel took second with a very unstable flight of four minutes. The other gas models, one belonging to Alfred Huber of the Bamberger Aero Club and the other to Ben Shershaw of the Kresge Aero Club, made no flights due to torque trouble.

At the National Meet of 1934, Bassett again proved his supremacy, winning first place against twenty-six other gas models. The meet was the scene of many new designs of which only a few proved their ability to fly. The major troubles of the models which were unable to fly were faulty motors and sudden crashes due to test flying.

At the recent Junior Birdmen Meet, sponsored by the New York wing and held in Lakehurst, New Jersey, many more official flights were made. The meet was a gas model builder's dream with its unlimited number of official flights.

There was no need for test flying, which at best is generally bad for the model, due to the fact that all flights were considered official and the model could be adjusted at the end of each flight. There was no holding back to see what the other fellow would do on his last flight as in the case of the N. A. A. three-official-flight ruling. Many of the prominent model builders would like the N. A. A. to drop this rule.

(*Concluded on page* 148)

Plenty of speed here! Henry Stadelmeir's model taking off and Harry must be all out of breath.

Frank Ehling gliding his latest gas-powered model before a flight. Caution versus crackups.

Frank Tlush warming up his powerful home-built gasoline engine. There are but a few home-built power-plants.

News From the Gas Model World

Contributions from our gas-powered model fans are of great interest to all of our readers who may be real pilots or armchair pilots. We are always glad to get snaps and descriptions of these planes.

WELL, here we are again with another collection of fine gas-power model photos which should warm up the hearts of the intending builders to the point where they will start to build gas models. There is sure a lot of activity along this line, extending from coast to coast, and every succeeding day sees more correspondence with the owners and builders of these m.del ships.

First, in our collection, comes the fine gas-model built by Bill Heermance, 14 McAllister Arcade, Miami, Fla. It was built from the Corben Super-Ace plans published in POPULAR AVIATION, some months ago, but instead of a converted Ford engine in the nose, it carries a Brown Jr. of considerably less horsepower.

After a few changes, which may benefit other model builders, Mr. Heermance says that it has proved to be a wonderful flyer with a record of 6½ minutes flight on three eye-droppers full of fuel. On its first test flight, it ended up with a broken prop and then came the change that so greatly improved its performance.

The motor mount was altered so that the motor is now pulling downwards by about one degree when under power. This gives a flatter glide which, of course, gives a better and safer landing, doing away with the previous tendency toward plowing her nose into the ground at the end of the glide.

The last time that this model was flown, there was little or no wind and the runway was damp and sandy, but in spite of these conditions, the model took off within 35 feet and climbed to approximately 500 feet in circles of one mile in diameter. It circled the field three times and, at the end of the glide, it landed in a tree bordering the field. The only damage, however, was a small tear in one wing.

With the exception of the motor mount, the model is built up of hard balsa structural members and is covered with silk. The cowl, not shown in the photo, is made of 0.010 inch aluminum sheet.

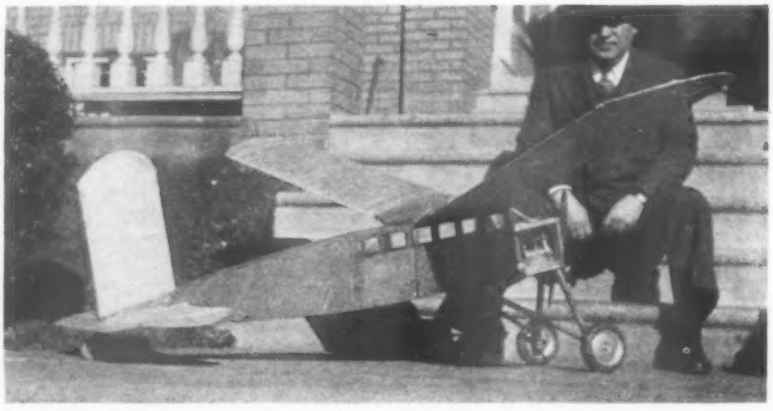
* * *

NEXT on the program, comes the creation of H. C. Carrsin, 4739 Osage Ave., Philadelphia, Pa., who, we are happy to announce, typifies the sort of man that we have long wished to see in model aviation, particularly in gas-model aviation. If a few more dads would get into the game it would be a wonderful recreation for them and a great asset to the cause of model building.

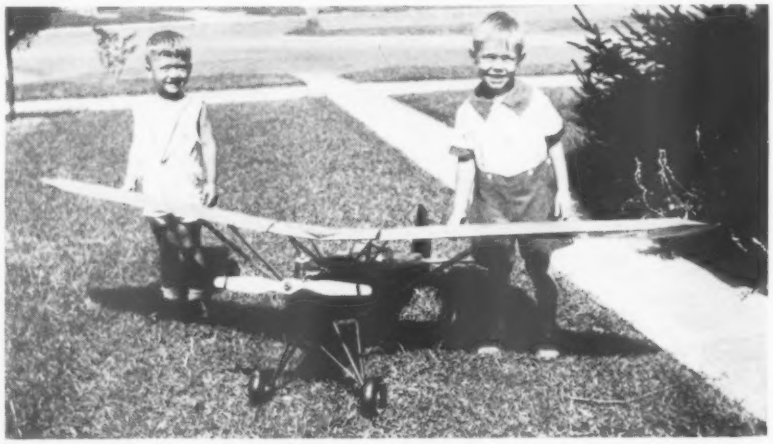
Mr. Carrsin writes, "When away from business, I find nothing more interesting than an airplane model magazine and a

(*Concluded on page* 148)

A gas model of the Corben Super Ace, built by Bill Heermance who has put up a life-like job even to the put-put-put.



Mr. H. C. Carrsin and his first gas model job, makes his bow to gas modeldom.



James Dixon, designed and built this nice looking job. We wonder who the two air-fans can be?

Building the "Vale" Pursuit

by

PAUL W. LINDBERG

Model Editor and Model Designer
for POPULAR AVIATION

THIS Italian model is very interesting to construct. Its clean lines, together with good stability, assures us of excellent performance. Our laboratory has worked into the model all improved features; such as movable controls with aluminum hinges, a real shock absorbing landing gear and many other features.

COLOR SCHEME

Entire Model—vermilion red, with exception of cowl and front part of fuselage, which are silver.

Details—black.

CONSTRUCTION OF FUSELAGE

It is necessary to place a sheet of ordinary wax paper over the plan to prevent cement from sticking to it. In building the fuselage, construct one side at a time. The longerons, vertical and diagonal braces, etc., are held in place until securely cemented, by inserting straight pins on either side of strips.

After the two fuselage sides are completed, they are pinned to top view of the plan in such a manner that the top longerons face down and the sides are at right angles with the table. The cross-members are now cemented in place, forming a rectangular fuselage.

Cut formers from 1/32-inch sheet balsa and cement in their respective positions as shown on plan.

Balsa nose plate is built up from 1/8-inch sheet balsa. Stiff paper is required between nose plate and formers —1-8 and 15.

The completed model of the "Vale," ready for flight.

CONSTRUCTION OF MOTOR

The cylinders are carved and sanded from balsa blocks. When five cylinders have been formed, wind heavy thread around them to represent fins. Make crankcase from two pieces of balsa. Rocker arm housings, push rods and other small details of motor are made of balsa.

CONSTRUCTION OF WING

Cut all ribs from 1/16-inch balsa. Pin the spar in position on the plan. Now, cement ribs in their proper locations. The leading and trailing edges are cut and sanded to shape and cemented to the ribs.

The panels carry movable ailerons which are a great help in controlling the flights. Make wing tips from 1/16-inch thick balsa. We highly approve of this type of wing tip, because it is much easier to construct and neater in appearance.

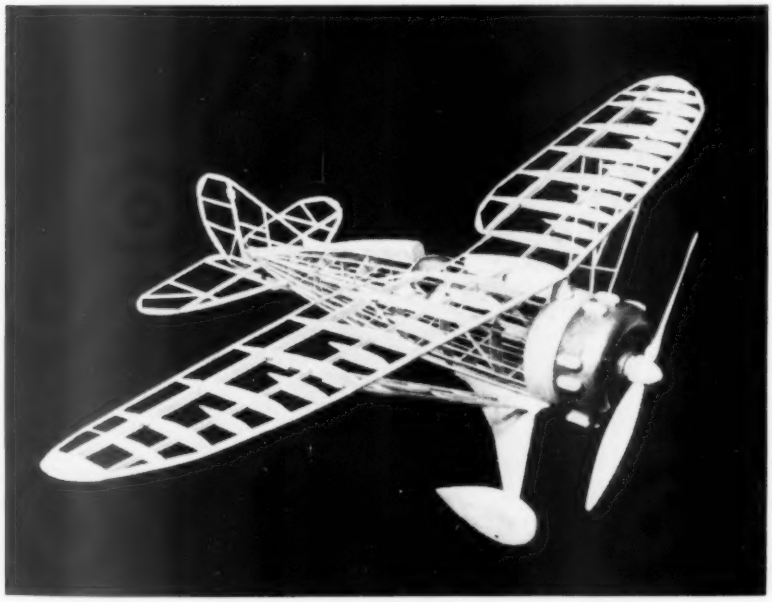
CONSTRUCTION OF ELEVATOR AND RUDDER

These are built from 1/16-inch square and flat balsa, and are constructed on the plan. Their construction is very simple, therefore, no difficulty should be encountered here.

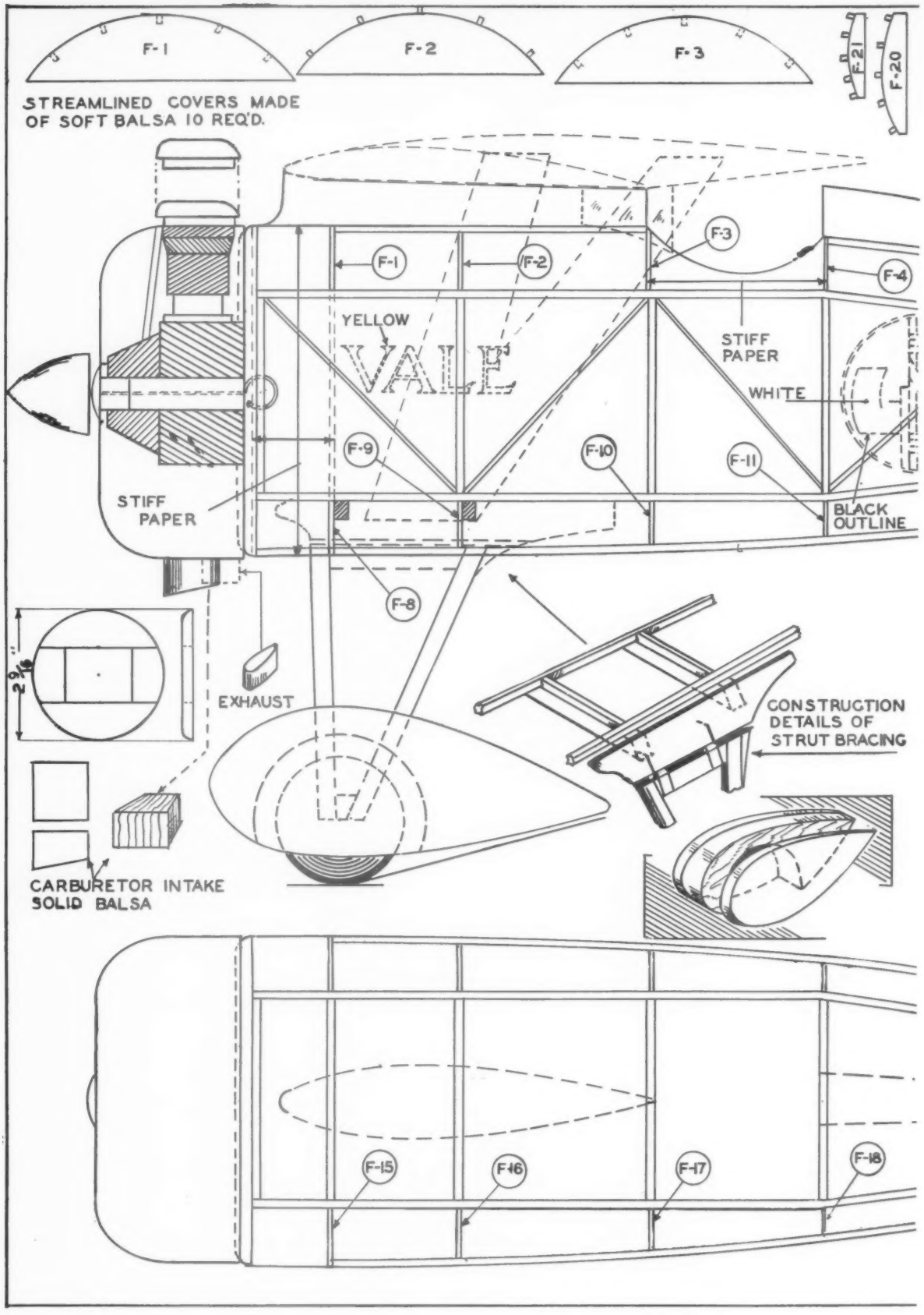
CONSTRUCTION OF LANDING GEAR

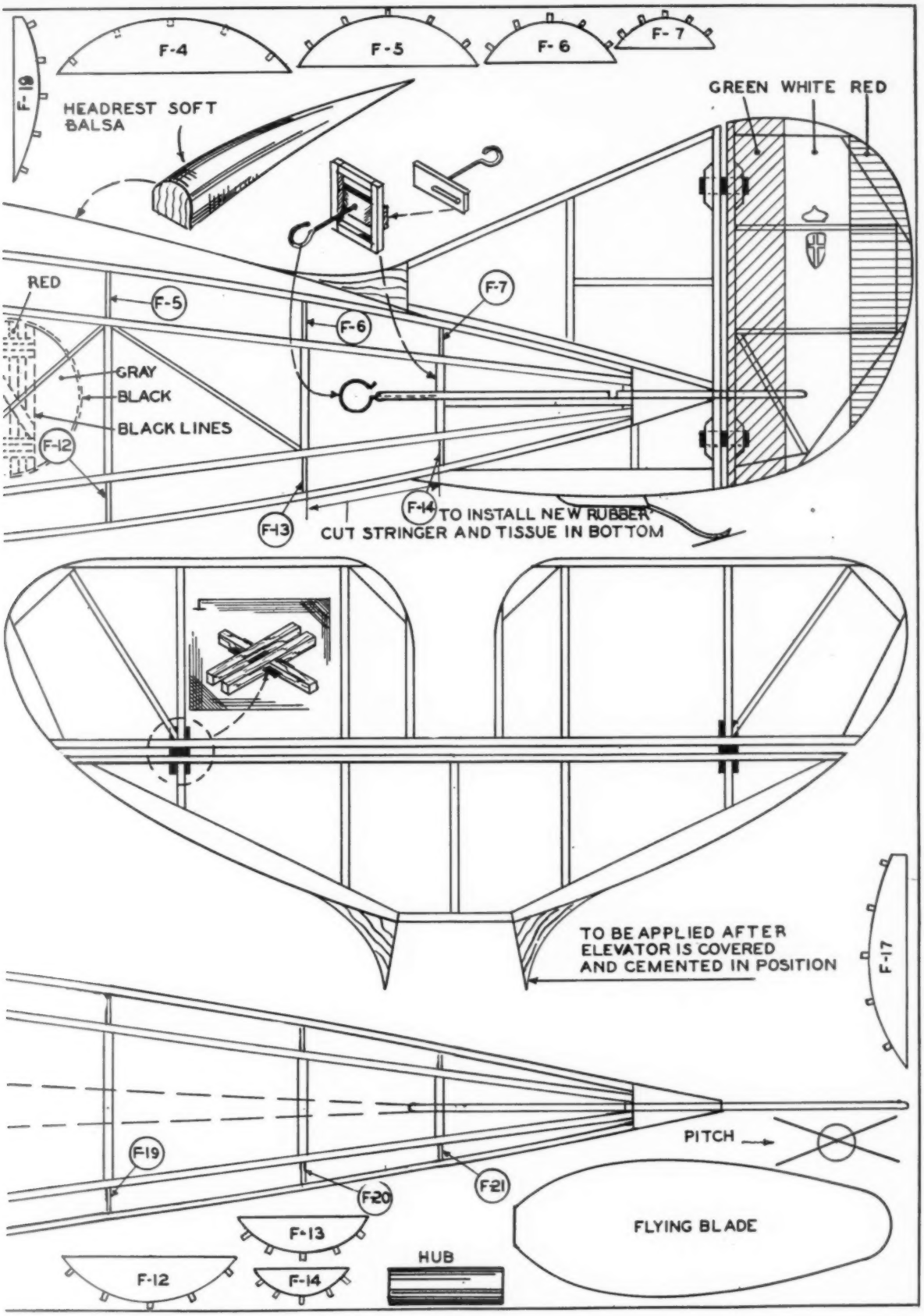
After the struts have been cemented together, cement them to the streamline wheel coverings. The wheel coverings are carved from three pieces of balsa and cemented together. Details on plan clearly show shock absorbing arrangement. The model can be built with or without shock absorber; however, we recommend the shock absorber, because it prevents damage to undercarriage when landing.

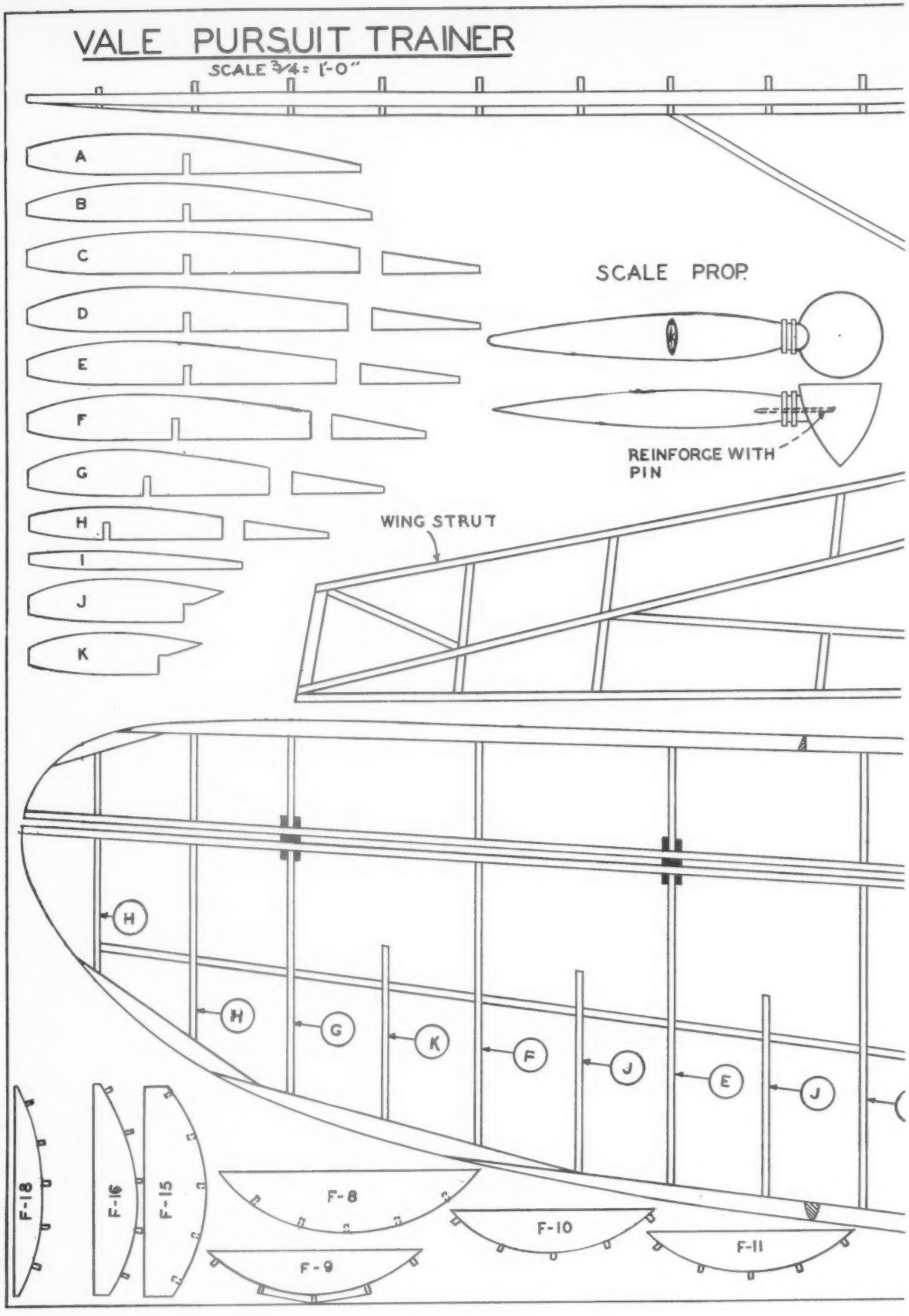
(*Concluded on page* 132)

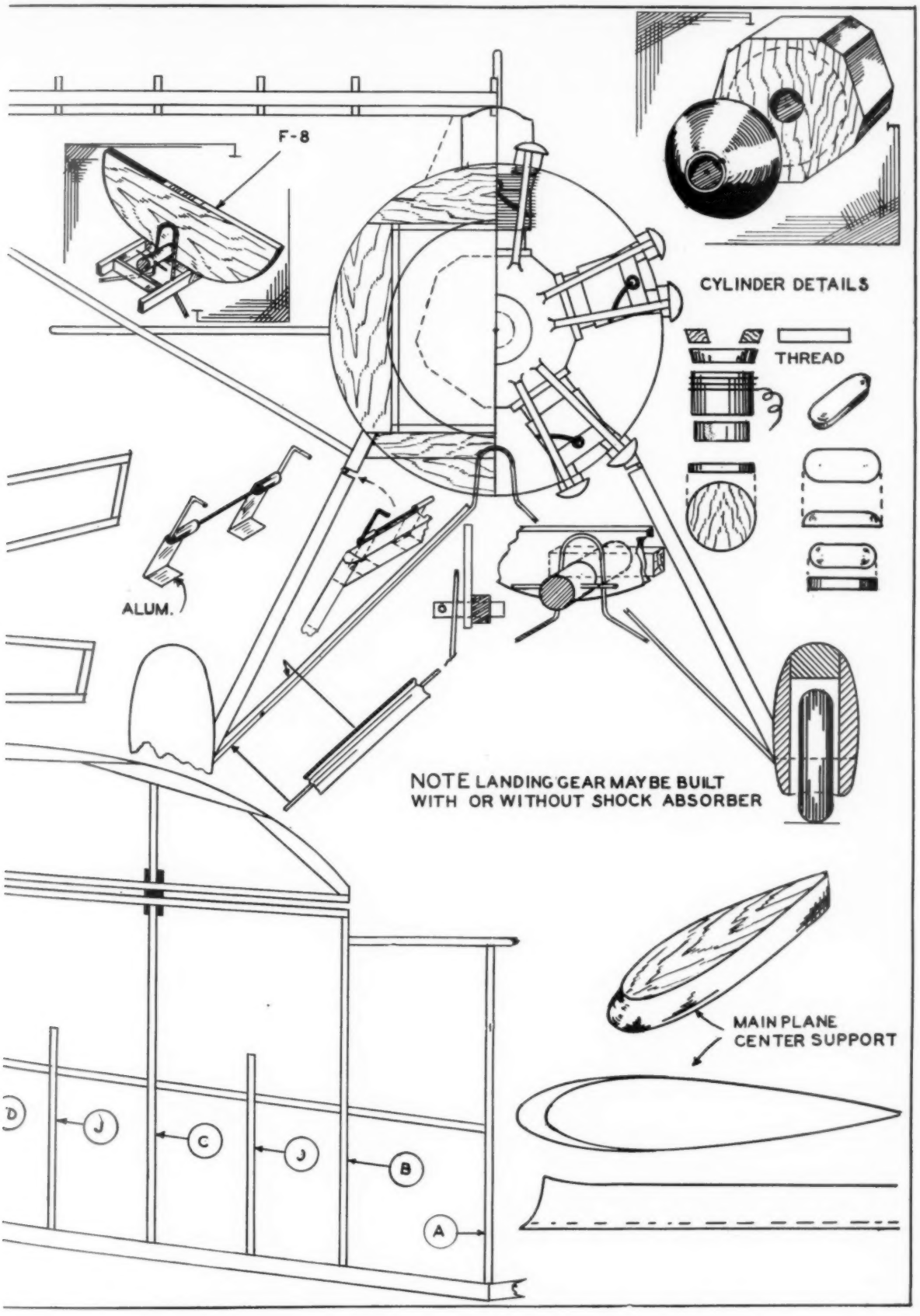


Framework of the "Vale" before covering.

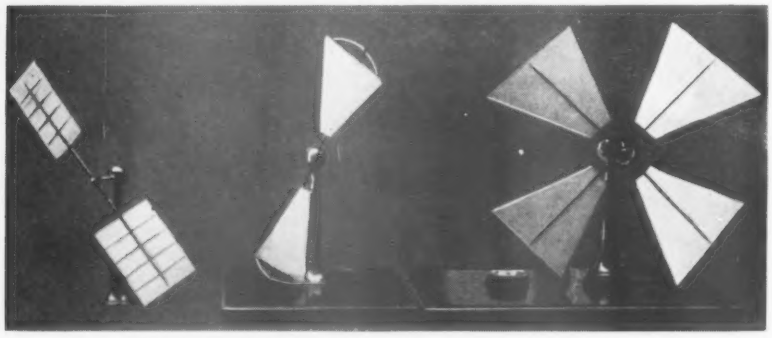

F-1
F-2
F-3
F-21
F-20
STREAMLINED COVERS MADE OF SOFT BALSA 10 REQ'D.
F-1
F-2
F-3
F-4
YELLOW
VALE
STIFF PAPER
WHITE
F-9
F-10
F-11
STIFF PAPER
BLACK OUTLINE
F-8
2 1/8
EXHAUST
CONSTRUCTION DETAILS OF STRUT BRACING
CARBURETOR INTAKE SOLID BALSA
F-15
F-16
F-17
F-18


F-4
F-5
F-6
F-7
F-18
HEADREST SOFT BALSA
GREEN WHITE RED
RED
F-5
F-6
F-7
GRAY
BLACK
BLACK LINES
F-12
F-13
F-14
TO INSTALL NEW RUBBER
CUT STRINGER AND TISSUE IN BOTTOM
TO BE APPLIED AFTER ELEVATOR IS COVERED AND CEMENTED IN POSITION
F-17
PITCH
F-19
F-20
F-21
F-13
F-12
F-14
HUB
FLYING BLADE


VALE PURSUIT TRAINER
SCALE 3/4 = 1'-0"
A
B
C
D
E
F
G
H
I
J
K
SCALE PROP.
REINFORCE WITH PIN
WING STRUT
H
H
G
K
F
J
E
J
F-18
F-16
F-15
F-8
F-9
F-10
F-11


F-8
CYLINDER DETAILS
THREAD
ALUM.
NOTE LANDING GEAR MAY BE BUILT
WITH OR WITHOUT SHOCK ABSORBER
MAIN PLANE
CENTER SUPPORT
D
J
C
J
B
A

A Few Early Propeller Designs



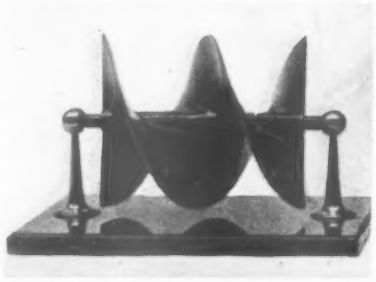
The paddle era. At the left is the simplest propeller, two rectangular blades, turned at an angle on a rod. In the center, we have the radial segment, two blade, and on the right is the same type with four blades.

IN the Paris Aeronautical Museum are a series of models showing the development of the propeller. They date back to the time of Ader, Stringfellow and the other early birds.

The first propeller was admittedly nothing but a pair of paddle blades, mounted on a rod and turned so as to make an angle with the shaft. Mostly, they were of fabric for lightness, stretched taut on a wooden frame. The flat faces of these paddles were very inefficient, because all parts of the paddle did not progress through the stream at the same rate. But it was at least a beginning.

The next step was a decided improvement, for the fabric was stretched between two rods, concave on one side and convex on the other, giving a rough approximation to the face of a helix or screw. These were made both in two and four blade types.

The most instructive model is carved out of wood in the form of true helix or Archimedian screw. The blades are of proper section while the angle increases from the outer tip to the center so that all parts travel forward at the same speed.



The helix or Archimedian screw. This first appeared in marine propellers and was later adopted on aircraft. This is a "true-screw" propeller. Slice taken at right angles to the shaft will be the true-screw propeller of today—at least in principle.

Hangar Housekeeping and Airport Management

The following news-letter from the engineering department of the Aero Insurance Underwriters should be studied carefully. It is full of good pointers on the subject of fire hazards.

WE are getting reports from many parts of the country indicating that hangars are becoming more and more crowded with airplanes. This naturally brings up the possibilities of fire and subsequent loss.

Crowded hangars make it difficult to attack a fire promptly or to roll ships out quickly and, in addition, they increase the usual hazards from the larger number of people that come into the hangars. The ideal lay-out from the fire point of view would be to have each ship in its own fireproof cubicle, such as at Wings Fields, Philadelphia. Of greatest importance, however, is the hangar housekeeping.

A wooden hangar with good housekeeping is a better risk than a steel and concrete hangar with poor housekeeping. We suggest that periodic checks be made of the housekeeping in the hangar. Well operated airports assign a responsible person to make periodic check-ups on housekeeping.

Avoid the accumulation of debris in corners and under staircases; clean waste cans daily; don't allow oily rags to collect; avoid exposed cans of gasoline or other inflammable liquids; see that no gasoline is escaping from the airplane tank vents and that the hangar is well ventilated to prevent the accumulation of fumes.

Confine smoking to areas such as club rooms where it can be done without risking the property of others; see that the electric conduits and equipment are in good condition; don't allow paint cans, brushes and soiled rags to accumulate inside lockers. Extension lights should have guards over them.

Be sure your heating system does not introduce a fire hazard; don't operate engines inside the hangars nor weld near the hangar doors. If you cannot weld in the open, or in the shop, have a fire-extinguisher at hand. Don't permit

(*Concluded on page* 130)

Pyroil Issues Report on Alloy Metals

IN a report now being issued by the Pyroil Company, LaCrosse, Wis., is given some interesting data on alloy metals (silver-cadmium, copper-lead and babbitt) direct from the technical and metallurgical laboratory.

It shows how these metals react under various conditions of operation. Both graphs and photomicrographs are included, showing visually the extent by which these metals are benefitted when Pyroil is used.

With a number of manufacturers at present using alloy metals in the construction of bearings and pistons, and with the likelihood of these metals being more widely used in coming years, this report is well worth the attention of aviation enthusiasts as well as those of the trade to whom matters of this nature are important.

This report will be mailed free and without obligation upon request to Pyroil Company, Dept. C-CP, LaCrosse, Wis.

Former Instructor Returns from China

WELLWOOD E. BEALL, former instructor in engineering at the Boeing School, recently returned from China where he represented the Boeing Airplane Company as sales engineer.

Mr. Beall recently visited his friends at the Boeing School and gave an interesting account of his experiences in the Orient and of the progress being made by Boeing graduates employed by China National Airways, a division of Pan-American.

He reported that a peculiar case of coincident terminology came to his attention while in China. It seems that the Chinese find it difficult to pronounce the word "Boeing", appearing on the Boeing 247-D owned by Marshall Chang Hsueh-liang, but that they can say "Bai Ying" which means "White Eagle", so everybody is happy.

Mr. Beall reports that graduate Arthur Kidder, whom he saw frequently in China, is making splendid progress and has recently been promoted to a first pilot's position with Pan-American's Chinese Division. He also has charge of instrument or blind-flying instruction.

Attention Canadians

EFFECTIVE with this issue, the price per copy in Canada, has been reduced from 30c to 25c. The subscription price has been reduced from $3.00 to $2.50. The price of POPULAR AVIATION is now the same in Canada as it is in the United States.

I Am Wearing These Two* Bargains in Above Photo

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A lot of accessories, equipment and supplies listed in my catalog, I bought many months ago when prices were right down to rock bottom. I bought immense quantities, so I got a much better "break" on price. Some of my stocks came from manufacturers who made the mistake of over-producing. Rather than let these stocks eat them up in inventory, these manufacturers have been glad to sell to me at prices far below actual manufacturing cost. Thousands of these items are listed in my new illustrated catalog.

I'll mail you one of my Bargain Books if you'll send me one thin dime to cover postage and handling. And I'll return your dime with your first order—large or small. Fair enough, isn't it? I guarantee that this amazing catalog of price slashed equipment will mean money in your pocket on anything you buy. Act at once! Send for this new catalog today.

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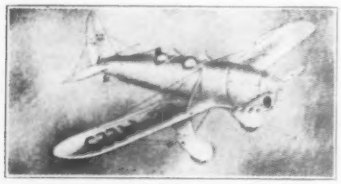

RYAN ST Wingspan 22½", Length 16½", Weight 2½ oz., Scale ¾"; with dual control system operates in either cockpit; adjustable wing flaps; and plans for making an engine with 4 cylinders, carburetor, spark plugs, etc. Complete Kit.....$1.50

BOEING P26A—Wingspan 21¼", Length 18" Weight 2½ oz., Scale ¾"; beautifully colored olive drab and yellow. Complete Kit.....$1.75

CURTISS GOSHAWK—Wingspan 23⅜", Length 16¾", Weight 3⅜ oz., Scale ¾". Complete Kit $2.00

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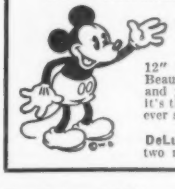
MARTIN BOMBER—Wingspan 35", Length 22½", Weight 4⅝ oz., Scale exact. Complete Kit $3.50

IDEAL'S NEW SENSATION Mickey Mouse Flying Airplane

(Not a Construction Kit)



Flies 100 to 300 Feet. A tough, durable, feather-light finished airplane that is ready to fly when you get it. 16½" wingspan, 12" length, 1 3/16 oz. weight. Beautifully colored red, black and yellow. Get one! You'll say it's the trickiest plane you ever saw! Price postpaid **75c**

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Ryan ST ☐ $1.50 Mickey Mouse Airplane ☐ 75c ☐ $1.00
Normandie ☐ $7.00 Catalogue Bulletin ☐ 5c
Please print name.....
Address.....
City..... State.....

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P. A. Expedition

(*Continued from page* 102)

When I later was able to see a synoptic weather map, it showed that the air northwest of me was at this moment 10°F. below zero. I did not meet any air so cold as this, but it was below freezing plenty of times before I was through. It seemed to me a part of great fortune, that there should be a pile of high mountains close at hand, so I changed our course to go over the tops of the Adirondacks, and to make a "U" shaped loop back to Albany.

All the newspapers in this part of the country now were carrying stories of how the ice was breaking down wires and closing roads. As we climbed the Adirondacks we came up closer and closer to the clouds, until at last we were in them. The cold-front was above these clouds, in fact, the clouds were the junction between the moist and rather warm air lower down and it was this icy air that was over-running it aloft. The air was coming in from the north-northwest. On the northern face of every mountain, where the cold wind struck, everything was sheeted with ice. On the other face, where the air boiled over and was warm and dried somewhat adiabatically, it was calmer and there was no ice, but only rolling mists. The cold air flowed over at about 1200 to 2000 feet of elevation.

Why it should flow at such a high level, instead of hugging the ground, as the older theories suggest (cold dry air being much heavier than wet air), I cannot at present say. But to make very sure that I was seeing it straight I went up into the Berkshires the next day, after attending to my business in Albany, and there too I found the cold-front air, just grazing the mountain tops. There was raging snow and ice on the tops, while below it was humid and rather warm, considering the season.

I went up into the Green mountains, too, that afternoon to see if I could find the clear blue sky air that I felt must be near, and which a weather map from Albany indicated was near. At Bennington, Vt., the sun came out for the first time since leaving Chicago. A little way beyond we passed over a high mountain, and could see the clear air off toward Quebec and the clouds and storm over Massachusetts.

This was Saturday evening. The mathematical forecast indicated that, at this time, a tongue of warm air from off the Gulf Stream should be nearing the New England coast. I suspected that, when the cold air we were immersed in, and this warm air tongue should meet, that we would have a rumpus. So I now ordered our course directed toward Rhode Island, which would be the nearest point where we would be likely to find the new warm air.

Near Worcester, Mass., we ran into heavy squalls of snow. It snowed and stormed all night. In the morning we ran down out of the snow into rain and found a brisk gale blowing in Providence. Curious to see just what it was like down on the ocean itself, we went down to Newport, and there we met winds of Force-9, which are just short of being hurricanes.

It was while we were moving around to observe this sea storm that the wave went over us. The water rose several feet all along that shore that night and the wind reached 74 m.p.h. for short spells.

Weathermen whom I met were at a loss to understand where so severe a storm had come from so suddenly. At Albany, they had assured me that no storm was in prospect and yet, within 18 hours, the worst gale in many a year was sweeping everything from Brooklyn to Eastport, Maine. I think I know, and I will venture this opinion:

This storm, while it was in some ways like a hurricane, had none of the gusts and squalls that so characterize a tropical storm. It was a furious steady blow from the east, where we were. A vortex, according to the maps, with its center well off shore.

Now, it seems to me, that this cold Greenland-front kept aloft during the whole of its course over the United States, never getting below about a thousand feet of elevation. I was up in it, on more than a dozen mountains, and it was alike on all of them. But weather observers on the ground, who had no upper air sounding devices, were ignorant of its presence.

When the cold air met the warm air over the ocean there came a most mighty mixing and turbulence, and from this the storm resulted. The storm did not extend in fury far inland. It was Force-9 at Newport, but never more than Force-6 or 7 at Providence. We could feel the wind lessen as we ran back and away from the salt water.

It, therefore, seems obvious to me that the same storm can have different manifestations in different places. This storm, for example, was a wind storm on Lake Erie, an ice storm in New York, a snow storm in Massachusetts and a gale on the Rhode Island coast, all from one cold mass of Greenland air.

END.

SELBY MAXWELL, in view of his original meteorological research and storm theory, has been granted a professorship in meteorology, Northwestern University, Evanston, Ill.

We congratulate Prof. Maxwell upon this acknowledgment of his valuable research, by one of the highest ranking universities in the United States. This connection will afford him many opportunities for the further development of studies in meteorology which directly reflect to aviation.

Prior to this engagement, Prof. Maxwell was, for many years, the science editor of the *Chicago Tribune*. It was through his intensive study of astronomy at Northwestern during his student days, that Prof. Maxwell evolved his present meteorological theories.

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AND NOW . . SELLEY BRINGS THE LUXURY OF SELLEY-TEX FLYING MODEL CONSTRUCTION SETS

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★ **MORE AUTHENTICALLY DESIGNED.** Minute details are moulded into model. Each is an exact, true-to-scale miniature of the original plane perfect in every detail.

★ **MORE DURABLE.** The moulded fabric shells are stronger though lighter. It will not warp, tear or puncture and is practically crashproof and unbreakable.

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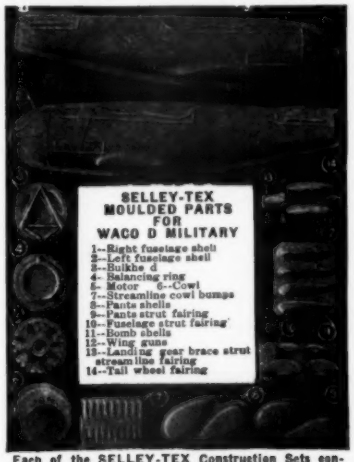
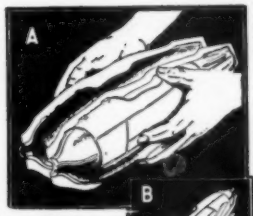
★ **POSITIVE MEANS OF BALANCING.** Simple ring device correctly balances plane. A new clever feature found only in these moulded models.

★ **PATENTS APPLIED FOR.** The moulded process is an original creation owned exclusively by Selley.

★ **MONEY BACK GUARANTEE.** A full protection money back guarantee certificate is included in every kit!



Each of the SELLEY-TEX Construction Sets contain the necessary individually designed moulded scale parts similar to those shown above.



Simple as A B C

A—Fit together and cement the two moulded parts of the fuselage.

B—Cut away the border of excess fabric.

C—The result is a perfectly shaped fuselage in the form of a hollow shell, very strong and indestructible.

All other SELLEY-TEX moulded parts as listed are equally easy to build.

Six new 1936 SELLEY-TEX stars sparkle in the model airplane sky. Now that you can buy SELLEY-TEX without paying more, why be satisfied with anything less practical and less modern? It's a joy to discover that at last you can easily and successfully build beautiful, authentic miniatures of the original airplanes and thrill to their super-performance! That is the verdict of everyone who tried this Modern Method of Model Building! SELLEY, ALONE, had the foresight and courage to invest thousands of dollars pioneering the FIRST PRACTICAL SIMPLIFIED KITS ever created. Now, more dramatically than ever, SELLEY captures the lead in TOP VALUE with the greater achievement in model airplane history! There is only one way to grasp the amazing superiority of SELLEY-TEX and that is to TRY it! See the coupon below and ACT TODAY!

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Simple to build and realistic in all details! A great little flyer, too! Wonderful Value!

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A perfect authentic reproduction of this famous London to Melbourne racer.

CURTISS OSPREY

$1.25
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WING SPAN 18¼"
LENGTH 13½"

Exceptional flight performance, authentic beyond belief. Full military equipment for realism.

LOCKHEED ORION

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LENGTH 12¾"

An amazing realistic replica of this famous transport flyer

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WING SPAN, 20"
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A beautiful miniature of the popular original and what a flyer!

VOUGHT CORSAIR, JR.

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This latest formidable looking military plane is built for stamina and designed for speed

WACO D MILITARY

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Space permits illustrating only one of the six models which comprise the DE LUXE line of SELLEY-TEX Flying Scale Model Construction Sets. All 24 inch wing span. Complete with all tools necessary to build model. For full listing order from coupon or see FREE offer below!

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Wide awake merchants will appreciate the tremendous sales appeal of these new competitively lower priced SELLEY-TEX kits. CASH IN on these exclusive sell-on-sight sensations. Write today for complete information, discounts, etc.

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Every model is packed in a beautiful, sturdy box with semi-finished flying or scale balsa propeller, formed propeller shaft and rear hook, sealed wheels, with brass bushings, ribs printed out accurately on white sheet balsa, many special turned wood parts, finest grade of balsa wood, sticks, tail wheel and fork fittings, control horns and wire, pure para rubber, special colored paper, authentic markings, colored insignia, best quality cement, colored dopes, full-size easy-to-understand plan.

FREE! Write for our beautiful, two-colored broadside illustrating in detail the new line of incomparable SEELEY-TEX Construction sets. Send 3c stamp for postage.

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Please send me the SELLEY-TEX model kits I have checked. I am enclosing $..... (check or money order.) (Each plane 15c postage. West of Denver 25c postage.)

MONOCOUPE	$1.25 ☐	REARWIN	$.75 ☐
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†WACO C CABIN	3.50 ☐	†BOEING F4B4	3.50 ☐
†WACO D MILITARY	4.00 ☐	†GOSHAWK	4.00 ☐

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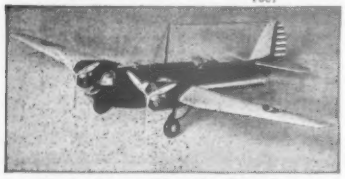
Even Better Than Advertised & More Realistic Than Pictured

Beautiful Fokker D-7 Fighter
Span 21¼", length 17". Rich in details. Orange, green, white, black details. Kit SF-15, $2.95. ("Dry" Dwarf Kit D-15, 60c)

U. S. Army Hawk PGE Fighter
Span 23⅝", length 16⅝". Most authentic Hawk on the market. Yellow, olive drab. Selfridge Field markings. Kit SF-21, $3.25. ("Dry" Dwarf Kit D-21, 75c)



U. S. Army Martin Bomber
Span 53¼", length 33⅜". Nothing ever before like it. Novel and strong method of duplicating an almost impossible landing gear (but not retractable—however it may be done). Turned balsa invisible hub wheels. Colored standard U.S. Army yellow, olive drab details black. A real kit. Kit SF-45..... $8.50 ("Dry" Dwarf Kit D-45, $2.50)

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Span 20⅝", length 17¾". Very popular. Super-detailed. Yellow and olive drab. Kit SF-23, $2.50. ("Dry" Dwarf Kit D-23, 65c)

4-Wheeled Howard Racer "Ike"
Span 15⅝", length 12⅞". Flies and climbs beautifully. Also data for "Mike." White, black details. Kit SF-42, 95c. ("Dry" Dwarf Kit D-42, 25c)

The Great Lakes Sport Trainer
Span 20", length 15⅝". Beautiful flights. Easy to build. Orange and cream. Kit SF-1, $2.65. ("Dry" Dwarf Kit D-1, 65c)

Von Richthofen's Fokker Triplane
Span 17⅝", length 14½". Famous war model. Authentic coloring. Red, silver and white. Kit SF-14, $2.50. ("Dry" Dwarf Kit D-14, 45c)

Schneider Winner—Supermarine S6-B
Span 22½", length 21⅝" overall. Many unusual features. Will R.O.W. Silver and blue. Kit SF-19, $2.50. ("Dry" Dwarf Kit D-19, 65c)

U. S. Navy Boeing F4B3 (or 4)
Span 22½", length 15⅝". Exciting to build—thrilling to fly. Silver, yellow, and red. Kit SF-29, $2.85. ("Dry" Dwarf Kit D-29, 65c)

READ BEFORE ORDERING

⅛-in. "Dry" Dwarf kits contain practically everything you get in the ¾" kits—except NO LIQUIDS OR STRIPING TAPE. Size is 2/3 size of the ¾" models. If less than 6 Dwarfs ordered, add 10c extra per kit for handling.

See Your Dealer if he can't supply you, order direct. No C.O.D.'s. Canada, Mexico, British Isles add 10% to above prices; other countries, 20%.

Dealers—Clubs! Send for Discount Sheets, and entirely new Merchandising Plan. Complete C-D catalog, 5c.

QUALITY CLEVELAND SERVICE
MODEL & SUPPLY CO., Inc.
1866PA2 WEST 57TH ST., CLEVELAND, OHIO

Airports

(*Continued from page* 126)

spraying, doping or welding in the same room at the same time. Remember that a teacupful of gasoline has the explosive strength of five pounds of dynamite.

In one instance, the mechanic tested out the transmitter of an airplane radio with the antenna temporarily suspended so that it cleared the fabric of the ship by only a few inches. A spark jumped from the antenna through the fabric to the metal beneath, starting a fire. If the hangar had not been protected by a sprinkler system, a loss of about $125,000 would have been incurred. Watch out when playing with your radio transmitter.

Quite frequently, during the term of your policy, conditions will change. Hazards may be increased or decreased without the agent knowing of them. Don't blame your agent entirely if you find yourself unprotected after a loss or an accident. The wise policyholder will keep in touch with his agent, inform him of the various things he is doing so that he will always be properly protected and, of course, a good agent will in turn try to keep in touch with his client for the same reason.

It is only a few hours from coast to coast or from border to border by airplane. An airplane covers territory very rapidly. The smart owner will see that his insurance protection is equally wide, that his insurance is placed with a company that can give him a helping hand whether he is in Maine or in California. This is most important for liability protection.

There are a lot of small landing fields that cannot yet afford the elaborate night lighting equipment of the larger airports. One airport manager recently remarked that the best way to illuminate an airport was to "turn on the moon each night."

Upon hearing the engine of an expected airplane, the attendant sends up the flare after having previously put out a few colored lanterns or kerosene bombs to outline the beginnings of the desirable runway. The flare is located to the left of the runway about at the point where the wheels will touch. The smoke given off by the flare indicates the wind direction.

This system has been successfully used many times by one of the largest operators who has flares cached at various landing fields around the country. Another suggestion is the use of batteries of automobile head-lamps at various corners of the field.

Balls of incandescent gases and hot sparks are frequently discharged from exhaust manifolds and impinge on the inflammable fabric, sometimes starting a fire. Army Air Corps Specification 14073 describes a fire-resistant enamel which is suitable for use over doped fabric surfaces and dries with a glossy appearance.

In giving weather observations, the dispatcher should consider not only conditions at the airport but also the conditions of approach at various radii and at various altitudes from the airport. Reports are coming in that pilots are encountering difficulty in finding fields while the man in the control tower broadcasts an ample ceiling. In one case the pilot almost shook hands with the Statue of Liberty.

END.

Announcing the

BRIEGLEB GLIDER

Here is the glider "Utility" and light plane you have all been waiting for. Constructed under a full A.T.C. and built to out-fly anything in the "Utility" class. On its test soaring flight the BRIEGLEB glider was flown for 14 miles. The Government OK's this ship for training, soaring and airplane towing. Send ten cents (coin) for full information and pictures. . . . Briegleb Aircraft Co., 3234 W. 27th St., Los Angles, Calif.

NOTE: This ship was fully tested by Speed Westphal.

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We are seeking a limited number of A-1 representatives who are qualified to sell our complete list of USED PLANES.

Only one man will be selected in your neighborhood. No money required as we foot all the expenses in connection with advertising our entire line. Our representatives can capitalize and cash-in on our valuable trade name and the large amount of national advertising put behind AVIATION PRODUCTS.

Liberal commissions offered and our representatives will be given every opportunity and encouragement to turn their franchise into a very profitable business. An easy way to set yourself up in a sound aviation business. Work right in your own neighborhood during your spare hours.

EXCLUSIVE FRANCHISES OFFERED

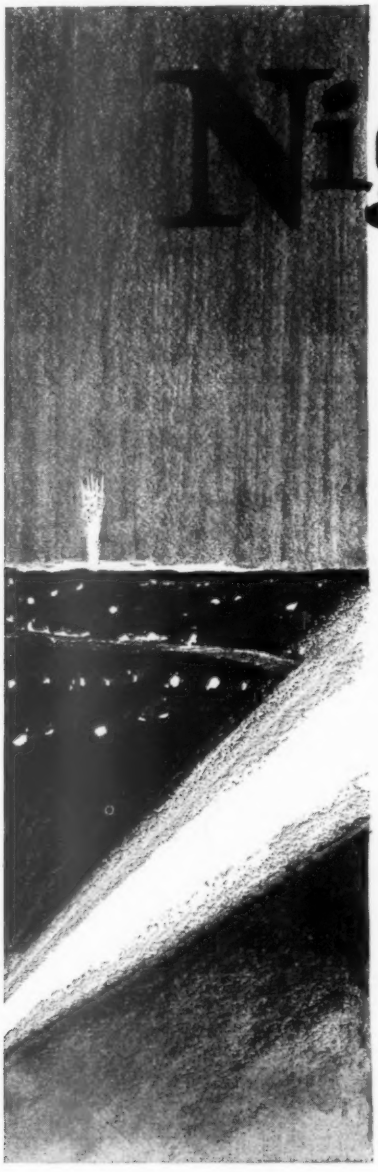
Only one man in your neighborhood will be selected and given exclusive franchise for the territory. To be eligible you must be able to line up at least one used airplane in your neighborhood that is for sale. References required. If retained you will receive commission on all used planes sold by us OUT OF YOUR TERRITORY as well as receive commission on any used planes from other territories that may be sold INTO YOUR TERRITORY.

All used planes acquired by us for resale will be nationally advertised and leads promptly turned over to the salesmen involved.

Send full particulars about yourself and planes for sale in your neighborhood. Address:

Major H. H. Woeltjen,
Manager, Used Plane Division

AVIATION PRODUCTS CO., 619 S. Federal St., Chicago



Night Flight

A white beam cutting the night with a long finger of light that ceaselessly sweeps the field in wide circles, boundary lights gleaming in the distance, green lights marking runways, here and there a red light indicating obstructions, illuminated wind tee, a roaring motor spitting out orange flashes of flame—such is the dramatic introduction to your first night flight. Possibly less spectacular, but hardly less dramatic will be your later realization of "having arrived". When you have finished a course at the Spartan School of Aeronautics, you will yourself be flying across the Nations airways. Spartan 3 STAR ★★★ Courses of aeronautics are yearly starting hundreds of young men like yourself in aviation with a broad foundation training that has behind it the resources of one of the highest rated schools of aeronautics in the country. Take the first step toward a successful career in aviation now, by deciding on proven training. Study the new catalog—see what SPARTAN has to offer, then YOU too, will want to become a member of the DAWN PATROL—training school of the successful in Aviation.

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	Per 100
1/32x1/16	10c
1/16x1/16	10c
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1/16x3/16	25e
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3/32x3/32	25e
⅛x⅛	30e
⅛x3/16	50e
⅛x¼	55e
⅛x⅜	65e
3/16x3/16	50e
3/16x¼	60e
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¼x½	1.60
⅜x⅜	1.90
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⅜x½x5	5e
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⅞x1x9	25e
¾x1¼x10	30e
¾x1¼x12	35e
1x1½x12	40e
1x1½x15	55e

BAMBOO

1/16 sq. x 14, 1 gross for 20c
1/16x¼x11, 1 doz. for 5e

36" Scale Craft Flyers. . . . Movable cockpit controls, simplified plans, alum. cowl, carved prop, . . . dealers are making enormous profits on our kits . . . write for dealers' discounts. . . . Your choice of the POSTROGERS LOCKHEED $1.50 each. . . . MONOCOUPE . . . $1.25.

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1x1½, each	8c
1x2, each	15e
1x3, each	20e
1x6, each	35e
1½x1½, each	25e
2x2, each	25e
2x3, each	35e
2x4, each	45e
2x6, each	60e
3x6, each	$1.25

BALSA SHEETS 36" Lengths

1/16x2, 10 for	14e
1/32x2, 10 for	15e
1/16x2, 10 for	18e
3/32x2, 10 for	21e
⅛x2, 10 for	23e
3/16x2, 10 for	32e
¼x2, 10 for	42e
½x2, 10 for	75e

● FREE ●
With every order: . . . 1 skein ⅛" flat rubber with every order . . . wholesale price of this rubber is 45c. Such gifts add materially to your profits.

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1/32 or 1/16 dia., 50 ft. for 18c
3/32 or ⅛ dia., 50 ft. for 20c

SHEET CELLULOID (Transparent)

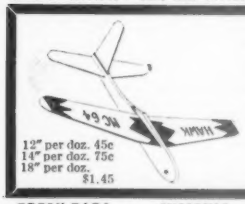
12½x16, each 19c
6x8, doz. 65e

COLORLESS CEMENT

1-oz. bottles, per ½ doz. 23e
2-oz. bottles, per ⅛ doz. 40e
4 oz. bottles, per ¼ doz. 70e
1 pt., each 45e
1 qt., each 75e
1 gallon, each $2.00

CLEAR DOPE OR BANANA OIL

1-oz. bots. ½ doz. 23e
2-oz. bots. ½ doz. 40e
4-oz. bots. ½ doz. 70e
1 pt., each 40e
1 qt., each 65e
1 gal., each $1.75



12" per doz. 45c
14" per doz. 75c
18" per doz. $1.45

DEALERS . here is your chance to make big sales. . . . These gliders are wanted by everyone . . . they sell to all big and small alike and you make a big profit, your choice of the following wingspans . . .

FRESH PARA RUBBER AAA GRADE

Per 225' skein

1/32 sq.	25e
.045 sq.	35e
3/32 flat	35e
⅛ flat	40e
3/16 flat	70e
Lb., any size	$1.25

CELLULOID WHEELS

¾" dia., pr., per doz. 24e
1" dia., pr., per doz. 25e
1⅜" dia., pr., per doz. 25e
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INSIGNIA SHEET

12 pr. & rudder and tail markings with gummed back. Doz., 36c; 100, $1.75.

BRASS BUSHINGS OR EYELETS

1/16 diam., per 100 ..... 12e
3/32 diam., per 100 ..... 15e
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HOW TO ORDER

No orders under $2.50 . . . all orders shipped express collect.

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White, per doz. 12e
Colored, asst., per doz. 15e
All colors. Silver, per doz. 21e

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White, yellow, orange, blue, red, green, olive drab, black, silver, gold or grey.
1-oz. bottles, per ½ doz. 25e
2-oz. bottles, per ½ doz. 50e
4-oz. bottles, ½ doz. $1.00
1 pt., each 50e
1 qt. each 85e
1 gal., each $2.25

Send for complete catalog.

DIAMOND
Model Mfg. Supply Co.

915-A2 Saratoga Ave. Brooklyn, N. Y.

Dictionary

(*Continued from page 94*)

(I)

Ia. A material employed in radio antenna.
ICE-UP. The formation of a thin layer of ice on the leading edge of the wing when passing through humid air at freezing temperature.
IDLE. To run the engine slowly without load.
IN-LINE ENGINE. An engine with all cylinders vertical and in one line.
INSTRUMENT FLYING. See Blind-Flying.
IRON HANDED. A tendency to overcontrol by excessively moving the controls.

(J)

JAKE. All right, correct. "All's Jake."
JAM. To make a device inoperative by the parts catching or sticking.
JAZZ-UP. To mix-up or confuse.
JENNY. A wartime training plane. Officially, the Curtiss Type JN-4.
JUICE. Electric current.

(K)

KICKER. The engine or motor.
KIWI. A man who has never left the ground, so named from the Australian wingless bird.

(L)

LAB. Abbreviation for laboratory.
LADDER ACTOR. A wing-walker or other acrobatic performer on a plane, particularly one who makes plane-to-plane changes by means of a rope ladder.
LANDING HOT. Making a landing at high speed.
LAY EGGS. To drop bombs.
LEG. One side of a race course or one of the sides of a closed triangular circuit.
LEVITATION. Self-suspension without assistance from the air or other surrounding medium.
LOG. A written record or history of an airplane or a flight made by the airplane.
LOG-BOOK. A book in which the history of a plane, the flights or an engine is recorded.
LOOP. To describe a full circle with an airplane in a vertical plane.
LOOP ANTENNA. A radio antenna or wave-contactor consisting of one or more turns of wire, generally in a circular form.
LOUVRES. Slotted openings in a hood or cowl for the passage of cooling air. Pronounced "Loov."
LOW. A "low" is an area under low atmospheric pressure.
LUBE. Lubricating oil.

(M)

MAG. Abbreviation for magneto.
MECH. Abbreviation for mechanic.
MG. Abbreviation for machine gun.
MIKE. (1) Abbreviation for micrometer, accurate instrument for measuring in thousandths of an inch. (2) Abbreviation for microphone.
mm. Abbreviation for millimeter.
MOCK-UP. A full size scale model of an airplane.
MOLY. Abbreviation for molybdenum, a rare metal used in steel alloys.
MONTGOLFIER. A circus name for a hot-air balloon.
MOSAIC. A map made up of an assembly of many small photographs.
MT. Meaning empty.
MUSH IN. For an airplane to settle down without forward speed, or to alternately stall and glide.

(N)

N.A.A. National Aeronautic Association.
N.A.C.A. National Advisory Committee on Aeronautics.
N.A.C.C. National Aeronautic Chamber of Commerce.
NACELLE. A short streamline body used as a body for an airplane or an enclosure for the pilot or engine.
N.C. An early type of navy flying boat.
NC-4. The U. S. Navy flying boat that first crossed the Atlantic.
NOSE DIVE. A steep dive with the nose down. Vertical descent.
NOSE HEAVY. An unbalanced plane in which the weight tends to pull the nose down.
NOVICE PILOT. A beginner.

(O)

O.C. Abbreviation of an "open cockpit" plane, or an open plane in which the pilot and passengers are exposed to the outer air.
OVERSHOOT. To fly outside of the desired area when making a landing.
OX-5. A famous American wartime engine produced in great quantity and used for many years after the war in civilian service.

(P)

PADDLE. The propeller.
PAN AM. Pan American Airways.
PANCAKE. To drop down quickly after flattening out for a landing. A partial stall due to low airspeed.
PANTS. Steamline covering for the landing gear members.
PASSENGER HOP. A short flight with a paid passenger.
PAY-HOP. A short trip made for compensation.
PAY-LOAD. The weight of the paid cargo.
PEG-DOWN. To fasten a plane to the ground with ropes and pegs when stored out of doors.
PENGUIN. A heavy low-powered training plane that cannot leave the ground except for low short hops.
PLOWING. A long run with a seaplane or flying-boat before taking off, in other words, "plowing through the water."
PORPOISE. A poor landing made with a seaplane in which the pontoons or hull bounce over the water, touching at intervals.
PROP. Abbreviation for propeller.
PULL OUT. The act of taking a plane out of a dive and bringing it into a horizontal path.
PULL-OFF. A means of using a parachute by which the jumper stands on the wing of the plane, pulls the rip-cord and allows the opened shoot to pull him off the plane. Some prefer this to jumping.
PUSHER. A plane with the propeller behind, pushing the plane ahead.
PUT-PUT. A small plane with a two-cylinder engine.
PYLON. A tower marking a turn in a race course or the end of the course.
PYLON POLISHER. A racer that hugs the pylons closely at each turn.

(*To be concluded next month*)

Model Dept.

(*Continued from page 121*)

COVERING THE MODEL

Apply tissue to the various framework members, using a light grade model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such to flat surface. This prevents warping.

ASSEMBLY

After the various parts have been covered, wing panel can be cemented into position. The wing struts are next cemented into position. Markings on both sides of fuselage can be painted on white paper, cut out and cemented to model. Other small details can be drawn with pen and ink and cemented to correct positions on model. All details clearly shown on plan.

TESTING AND FLYING

Two types of propellers are used on this model. One, which has a wide blade, is made of fiber. This type of blade causes the motor to turn at less r.p.m. and greater flights result. By twisting the blades, the pitch can easily be adjusted. The balsa scale propeller is used for exhibition purposes only. Six strands of ⅛ flat rubber are sufficient to fly the model.

END.

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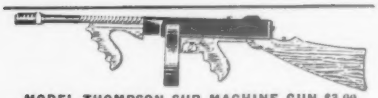

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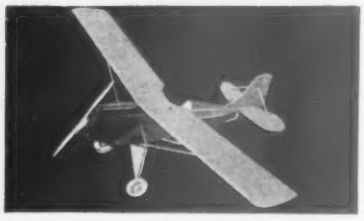

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PURSUIT MACHINE GUNS
⅝", 1¼" or 1¾" ea. 05
PROPELLERS
2 blades 3 blades
1½".....08 10
2⅛".....12 15
3⅛".....18 20
4½".....20 25
WING AND TAIL LIGHTS
12", 10c; 15", 15c; 24", 20c

Can't Fly!

(*Continued from page* 106)

guilty, he would get me off with a suspended sentence. Being without the necessary funds to hire an attorney, and not knowing anyone else who owned an unlicensed ship to ask for help, I was finally convinced that I would be convicted anyway and put in jail, so I plead guilty.

As soon as this was over, I sent for a copy of the Federal laws, also a copy of the Iowa State laws and took them to an attorney. We found nothing that they could stop us with as long as we had our identification numbers on our ship, and our certificate in the cockpit and we all have that.

This attorney has worked on our case all summer and so far there are five in our group who have supported him, but I would like to get into touch with every unlicensed airplane owner in the State of Iowa or any other state.

Yours truly,
Lurlin Collins.

Our indignation is raised to the boiling point every time we hear of this sort of treatment handed out to an amateur pilot. It rather brings to mind that the State of Iowa has not been altogether free from major accidents with licensed pilots and licensed ships, so that the politicians' idea of what is safe and what is not safe, does not seem to be bearing much fruit. The same thing has been pulled off in Illinois, Washington State, Oklahoma and elsewhere.

There is no other branch of aviation in which there have been more or bigger accidents than in commercial aviation with everything licensed up to the handle, but still they are allowed to pursue their way with but a little penalization. The word, "home-built," for some reason or other, seems to get under our legislators' hide, and they are endeavoring to stamp out everything home-made, except perhaps, home-made pies, cake and home-brew.

END.

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Torque

(*Continued from page* 103)

increases with the increasing speed. From this point on, the horsepower diminishes while the torque decreases even more rapidly because the speed is increasing with a decreasing horsepower. The torque reaches a maximum at a point about two-thirds of the maximum horsepower with the usual type of auto engine. And, the counter-torque varies with the torque, but in the opposite direction.

The mathematical equation for torque is as follows:

$$\text{TORQUE} = \frac{63{,}025 \times H}{N} = \text{inch-pounds.}$$

Where (H) is the horsepower at that instant and (N) is the number of revolutions per minute. Let us say, for example, that we have a one-fifth (0.2) horsepower engine running 3,000 r.p.m. Then the torque and counter-torque in inch-pounds will be:

$$\text{TORQUE} = \frac{63{,}025 \times 0.2}{3{,}000} = 4.2 \text{ inch-pounds.}$$

This will be equal to placing a weight of one pound on the wing, 4.2 inches from the centerline of the motor crankshaft. If this engine developed 0.1-horsepower at 1,000 r.p.m., then the torque will be:

$$\text{LOW-SPEED TORQUE} = \frac{63{,}025 \times 0.1}{1{,}000} = 6.3 \text{ inch-pounds.}$$

Under these conditions, it would be necessary to move the one-pound weight about 2-inches farther out on the wing to balance the counter-torque, or it would have about one-third more counter-torque than in the first place.

This will show why torque varies with the power of the engine and the speed when the loading is assumed to be uniformly applied, as with a brake. With the propeller, the matter is much more complicated than with the brake because the propeller load varies approximately with the "cube" of the speed. In other words, the maximum load comes on quicker and more sharply with the prop than with the brake, and things may start to happen to the counter-torque before the engine reaches its maximum speed and output, if the propeller is not properly adjusted to the engine. For example, if the propeller will only allow the engine to gain about two-thirds of its maximum speed and output, then we will have a maximum torque at two-third speed.

END.

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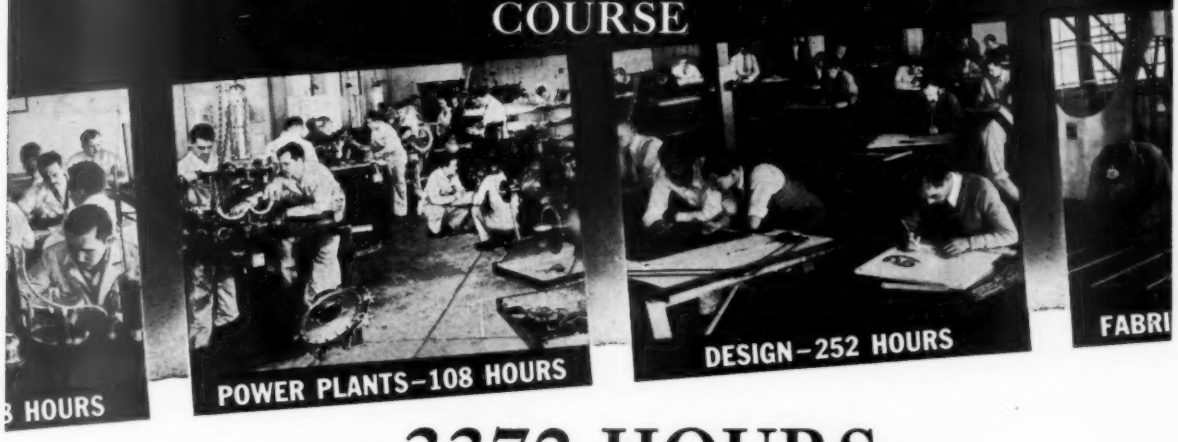

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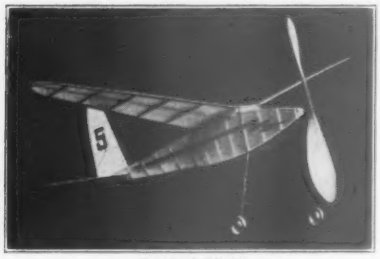

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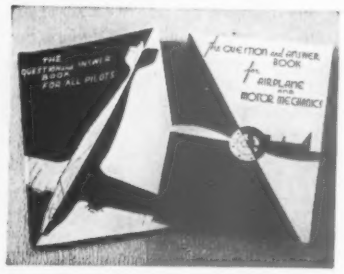

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AERO PUBLISHERS, Inc.
Department A Ramsey Tower
OKLAHOMA CITY, OKLA.

1st Aero Squadron

(*Continued from page 90*)

the ship instantly. A pilot would never pick a fight while photos were being taken. But he'd defend his ship when attacked.

Because of these factors, anti-aircrafts searched the heavens for OB's, knowing they would try to maintain an even altitude. This meant it was easy for Archie to get the correct range. *Chasse* pilots hunted for OB's as easy prey and because photographs revealed countless military secrets.

Strict standing orders of the Boche Air Force were not to permit Yank OB's to take pictures; if they did, not to let them get back. The best pilots of the enemy's air force made many attacks on 1st Squadron planes. Much to the Huns' horror they discovered that pilots of the 1st Squadron got the jump on Fokkers and Pfalz by frequently attacking first.

MOVING to Saints airdrome, 55 kilometers behind the front lines of the Marne sector, the squadron was issued two-seater Salmsons the end of June. And did the mechanics sweat blood! Unfamiliarity with the engine and the difficulty of obtaining spare parts forced mechanics and pilots to often work far into the night to get planes in commission for the next day's patrols.

The big final push of the Huns, which centered around Chateau Thierry, was near at hand. The Germans had amassed a large and very powerful force of airplanes, its best trained and most daring pilots, and anti-aircraft guns, calculated to drive the French and American Air Services out of the battle skies.

Flying conditions were at their worst along the Marne and Vesle, but Corps HQ *had* to have information about troops movements and their positions. The greatest importance was attached to photographing the enemy's work.

In the constant fog and rain this meant hedge-hopping in order to get the desired pictures. It meant constant danger from anti-aircraft guns as well as low flying enemy pursuit pilots intent upon preventing the Yanks from taking photos. Many terrific aerial battles were fought against enemy patrols of from 7 to 20 planes.

During that trying period and the three days the Boche were being smashed into full retreat, July 15, 16 and 17, three American airmen took the brunt of the routine and special missions—Lieut. William P. Erwin, pilot, and Lieutenants Arthur E. Easterbrook and Byrne V. Baucom, observers. They became the three first ranking Aces of their squadron.

The success of the Allied counter offensive of July 18th changed materially the work of the observation squadrons. A war of movement had begun. Tougher and newer missions confronted the 1st Squadron. Contact patrols with infantry units became of great importance.

Headquarters had to know where their units were located. Regulating our artillery fire became more difficult due to the bad weather and rapid advance of certain ground elements. Infantry liason work meant low flying in the face of a constant heavy enemy ground fire. After contacting our infantry, Lieutenant Erwin, with Observer H. John Boldt, decided to machine gun the German front line. Boldt was killed instantly when a bullet struck him in the head.

At St. Mihiel, land and air forces of the 1st American Army were put to the acid test against the enemy's four-year-old stronghold and came through magnificently. A month before the first major operation for the Americans, intensive preparations were made under severe conditions.

Visual observations and especially photographs of Hunland and the enemy positions were in great demand for careful study by ground officers. For four weeks the 1st Aero Squadron worked like fiends to get the required information.

Every flight had to fight its way over the lines and fight its way back. Casualties were heavy. Four weeks of man-killing work to help make possible the wiping out of the St. Mihiel salient in but four days!

The battle sky was full of planes on the first day of the St. Mihiel offensive. Corps HQ was in desperate need of photos. No pursuit plane protection was available. But Yank airmen of the 1st Squadron responded gallantly to the call. 2nd Lieut. Ralph E. DeCastro, pilot, volunteered with 1st Lt. Easterbrook, observer, to fly a long-range photo mission over the enemy lines, unprotected.

Winging through rain and fog and high winds, at no time over 400 meters from the ground, DeCastro held his plane to its mission, penetrating 4 kilometers behind the Hun lines. When they were attacked by 4 speedy Pfalzes the Yanks manned their guns to fight off their foes and returned safely.

Art Duckstein made a special command flight to learn if the Boche were concentrating troops between Montre-

(*Continued on page 140*)

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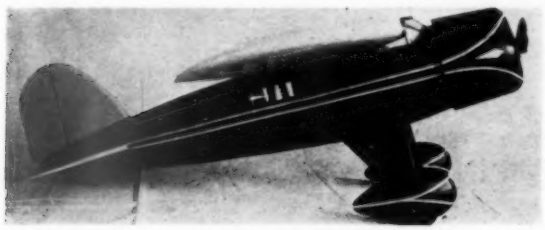
28" Span, Length 20½", Weight 4 oz., 1" Scale

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD

A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3⅜" celluloid, 700 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing.

Construction Set Complete, postpaid..... $4.50

NEW LOCKHEED ARMY SPEED VEGA

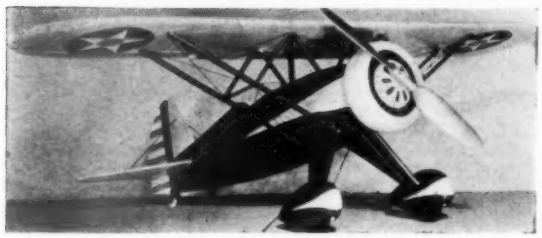


41" Span, Length 28½", Weight 7 oz., 1" Scale

A special De Luxe model of one of the latest series Vega. This is a marvelous flyer and has many special strength features. Set contains all parts printed on balsa, a 4¼" turned motor front, 2½" wheels, tail wheel, ready cut pants and landing gear, 11" steel type carved paulownia wood prop, colored dopes, glue, tissue, rubber, and all parts to build.

Construction Set, postpaid..... $4.95

NEW BOEING F5B2 ARMY FIGHTER



24" Span, Length 15½", Weight 2½ oz., Scale ¾"

A scale flying model of one of the latest fighters. Set contains all parts printed on balsa, a 3" celluloid motor, 3½" tapered aluminum cowl, colored dopes, 8" carved prop shown. **Construction Set, postpaid..... $2.95**

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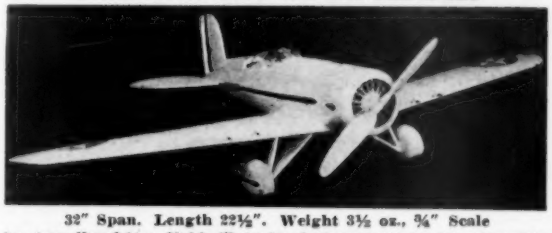
A new, improved model. Very strong and an excellent flyer. Set includes all parts printed on balsa, hollow metal exhaust pipes, aluminum wheels, 2 oz. yellow dope, 1 oz. drab, 1 oz. paper cement, 2 oz. glue, Army lettering, numerals, bearing button instrument board, tail wheel, colored insignia and all parts to make model as shown. **Set postpaid..... $2.50**

NEW LOCKHEED P23A NAVY FIGHTER

COMBINATION LAND AND SEA PLANE SET



32" Span. Length 22½". Weight 3½ oz., ¾" Scale

New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc. printed on balsa, a 3¾" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ⅛ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 foot rubber, large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world.

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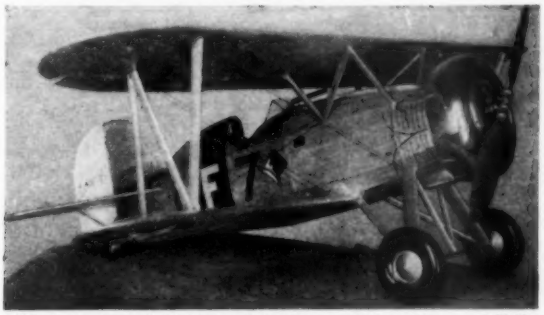
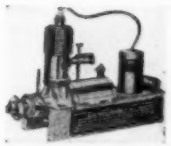


22½" Span. Length 14½". Weight 2½ oz., Color, Silver and Yellow

This is the finest equipped Boeing F4B4 model in the world. New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished propeller, printed out balsa wood parts, silver dope, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing. **Construction Set Complete, postpaid..... $2.95**

1/5 H. P. Gas-Motor
Weight As Shown 12 oz.



Long life motor has steel cylinder and piston, ⅞" bore x 1" stroke. Comes complete with gas tank, coil, condenser, batteries. Price ready to run, complete, postpaid. Only **$22.50**

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Exact scale model of the Navy's latest 272 m.p.h. fighter. Set includes all parts printed on balsa, 3" turned cowl front, colored insignia, lettering, colored dope, drawing, etc.

Construction Set, postpaid..... $2.00

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68" Span. Length 44". 2¼" Scale. Color Silver

This is not just an ordinary large model, but one specially designed and engineered to stand the strain of the gas motor. The most realistic and life-like model of this size ever produced. As all the fuselage formers, wing ribs, tips, etc., are all cut out and notched for stringers, spars, etc., even a novice can make a perfect model of it with ease. Set contains 6" turned balsa wheels with bearings, rubber tail wheel, a special turned balsa 10" speed, cowl ring used on the latest Boeings, silk covering material, silver and red dope, glue, full size scale drawing, axles; all wood cut to size, etc. Weight of model with motor 3¼ lbs.

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1¼x1¼ 8—.05
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.002 thick.... .08
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3" diam.. .34

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1/8..07 1/4..10

ALUMINUM LEAF

(.0003 of an inch in thickness, 3½ wide).
5 feet for.... .05

TURNED HARD WOOD WHEELS

Per Pr.
½"..02; ¾"..03
1" ..03; 1¾"..05
1¾"..07; 2½"..10

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With each $1.00 order: 2 insignia sheets, 3 pair wheels, ass't sizes, any sized carved prop up to 7". With each $2.00 order: 250 ft. ⅛ flat rubber.

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½" to 1".. .18
1⅜" to 1⅞".. .33

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2" x 2"....l—.20
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½x ¾x 6.7—.05
¾x1 x 7.3—.05
¾x1 x 8.2—.05
¾x1¼x10.l—.04
¾x1¼x12.l—.05
1 x1½x12.l—.07
1 x1½x15.l—.08

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1 oz. .05 2 oz. .08
4 oz. .15 1 pt. .50

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3/16 flat	12—.05

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12 pr. and rudder and tail markings with gummed back.
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Pkg. of 100 .05

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1 oz. .05 2 oz. .07
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Thinner same price as clear dope

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4 oz. .19 1 pt. .65

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White, per doz.... .18
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SILVER TISSUE

20"x24"..Ea. .05

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1" .05 1⅜" .07
1¾" .12 2" .20

CELLULOID WHEELS

Prices per pr.
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1⅜" .10 1⅞" .16

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1/16 sq. x 14 35 for .05
1/16 x 1/4 x 11 1 for .01
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(⅛ or ¼ dia.)
1 doz. 01
1 gross 10

WIRE

Straight Lengths Nos. 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, or 16.
6 ft. for..... .03

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1/32 or 1/16 9 ft. for .02
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SANDPAPER

5 large sheets .05

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1/16"x12" 1 doz. .06
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Fuel Requirements

(*Continued from page* 114)

ful load for any objective, proves to be practically a straight line.

If the main interest of the plane be to carry the greatest possible useful load, then it travels under the best range conditions, for if it flies at maximum speed, the load it carries must be reduced practically one-third. Likewise, the maximum range is considerably less than under greatest range conditions, and a noticeable gain in range is achieved by flying at the proper angle and hence at proper speed.

Looking back at table 2a, you will note that the results for flight at maximum speed are tabulated. Gas consumption is constant and the speed of advance constant to within approximately one per cent.

If a plane flies at minimum power, the gas consumption is practically the same as that at best range power. Although the minimum power is a little less than the power for best range speed, the speed is also less and the propeller efficiency is also slightly less.

Consequently, the final result is that the time of flight is about the same and the maximum range is diminished. An example to show the slight difference is given in a calculation where the range at minimum power gives 2,400 miles instead of 2,480 miles. For flight at minimum power the angle of attack is practically constant and slightly greater than that for best range speed.

In calculating the time required for any range, note was made in particular that the maximum time of flight under high speed is 16.4 hours as against 38.0 hours for best range speed.

In an example of a bombing raid with an objective of 600 miles, the total elapsed time to go and return is for maximum speed 11.25 hours and for best range speed 18.65 hours. It is possible to decrease this difference by flying at high altitudes without changing the efficiency for best range conditions.

These studies, made by J. G. Coffin, Director of Research, Curtiss Engineering Corporation, for the National Advisory Committee for Aeronautics are the only material available on the subject and are, therefore, highly important. At present there is no new material to bring this up-to-date.

*TABLE 3. TIME-WEIGHT VARIATION COMPUTATION FOR SPEEDS

MAXIMUM RANGE

Initial weight of machine in pounds	Thrust in pounds	Velocity in miles per hour	Gasoline consumed, pds. per hour	Distance, miles		Gasoline consumed in interval. Pounds	Time in hrs.
				S=Vt.	Total		
15,000	1,560	77.5	297	155.0	155	594	2
14,406	1,500	76.3	286	152.6	307.6	572	4
13,834	1,450	74.9	273	149.8	457.4	546	6
13,288	1,403	73.3	261	146.6	604.0	522	8
12,766	1,355	71.3	250	142.6	746.6	500	10
12,266	1,305	70.5	240	141.0	887.6	480	12
11,786	1,265	69.0	230	138.0	1,025.6	460	14
11,326	1,225	67.5	220	135.0	1,160.6	440	16
10,886	1,185	66.2	210	132.4	1,293.0	420	18
10,466	1,145	64.7	201	129.4	1,422.4	402	20
10,064	1,110	63.5	193	127.0	1,549.4	386	22
9,678	1,065	62.2	184	124.4	1,673.8	368	24
9,310	1,030	61.0	177	122.0	1,795.8	354	26
8,956	995	59.7	169	119.4	1,915.2	338	28
8,618	965	58.6	162	117.2	2,032.4	324	30
8,294	930	57.4	155	114.8	2,147.2	310	32
7,984	900	56.3	148	112.6	2,259.8	296	34
7,688	872	55.1	142	110.2	2,370.0	284	36
7,404	840	54.1	136	108.2	2,478.2	272	38
7,132	815	53.3	132	106.6	2,584.8	264	40

*Courtesy N. A. C. A.

END.

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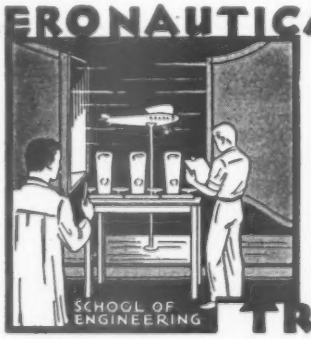

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- ☐ Fokker D-8
- ☐ Polish Fighter
- ☐ Monocoupe
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- ☐ Aeromarine
- ☐ S. E. 5
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1st Aero Squadron

(*Continued from page* 136)

beau and Exermont, which might indicate an enemy counter attack. Art had to stay down below 200 meters to carry out the mission. The weather was bad, but the hail of ground fire constantly directed at him was worse. His ship was riddled and Art was severely wounded. But he kept his nose up.

Suffering from intense pain he flew back, wrote out a clear accurate message and dropped it to HQ. The Huns sent an entire fresh division into the counter attack, but Duckstein's accurate report made it possible for the American soldiers to crush the attack.

Throughout the daylight hours, planes bearing the miniature Stars and Stripes insignia, never faltered. The squadron won the acclaim of those in high command. The Corps Commander wrote the Chief of Air Service as follows:

"The Corps Commander is extremely gratified and pleased with the effective, splendid work of the observation squadrons of the Corps.

"In spite of control of the air by the enemy, the pilots and observers have been tireless and successful in carrying out their mission of observation and taking photographs which have played a great part in the successful advance of the Corps.

"The Corps Commander desires that you convey his personal thanks to your command, and he further desires that the names of those whom you deem worthy of special recognition be reported promptly to these Headquarters for transmission to the Commander-in-Chief."

Before the end of September, General Pershing announced: "American aviators have kept command of the air."

American aviators had stood the test! They had made good!

THE squadron's reward was to be delegated to cooperate with the American ground troops in the longest and greatest battle in our history—the Meuse-Argonne. The American Expeditionary Force was determined to make "one tremendous sustained effort to crush the Boche and end the war then and there in a victorious manner," says General Pershing. "Preparations were begun for the tremendous attack against the line the enemy had held for 4 years and must hold at all cost to prevent a crushing blow being dealt its entire military organization."

Surprise was the all-important element for success. Secrecy for the aviation units would be very difficult. Many special missions had to be flown; increased activity would be instantly noticed by the enemy.

Moving to Remicourt, Sept. 20th, the 1st Squadron hit upon the clever strategy of flying old French observation planes. The trick completely fooled the Boche.

Throughout the 47 days of persistent battle, and until the Armistice, the weather was extremely bad. Rain, high winds, poor visibility, and fog, fog, *fog!* The bad weather brought grief to three ships in two days.

First Lieut. John H. Michener from Erie, Pa., was assigned to fly an observer to locate the American front lines near Varennes, Oct. 4th. The "soup" was so thick he was forced to fly at only 100 meters. A signal rocket set off by his observer drew a stream of lead from an advanced Hun machine gun nest.

Bullets ripped the belly of the plane to bits. One wounded Michener in the leg. Despite his wound, the intense pain, and weakening from loss of blood, the pilot kept on until the American positions were located. Then Michener was forced to land in shell-torn land behind the lines. His ship was completely wrecked.

The following day "Lone Star" Bill Erwin, with Baucom as his observer, flew into the face of death to locate the position of German troops holding up the American advance near Sedan. Their officers had warned them to stay grounded due to the thick weather. Erwin jockeyed through a terrific ground fire and when they located the enemy machine gun nests Erwin circled while Baucom poured a devastating twin-Lewis machine gun fire at the enemy, breaking up a number of nests.

The Yank ship was shot down, but Erwin managed to nurse it to No Man's Land and a safe landing. Together Erwin and Baucom fought off capture

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by German infantrymen, regained the American lines and reported the desired information to HQ.

Oct. 6th, 2nd Lieut. Jimmie Richardson undertook a hazardous flight so that his observer could make contact with Yank infantrymen advancing to take Grand Pre. The thick clouds forced the gritty lad from Nashville, Tenn., to fly at 100 meters. German ground fire made a sieve of the OB and Jimmie was shot in the foot. Kicking the rudder as best he could, Richardson carried on while his observer wrote a report for the Division Command.

The 24-mile front soon lengthened to 90 miles, with an average depth of 20 miles. Despite the 13 balloon companies along the front, there were many days when Corps Observation was the sole source of getting desired information for Headquarters.

The 1st Squadron not only got the information, but they shot up enemy machine gun nests, strafed columns of retreating troops, shot down pursuit planes, defended American balloons from attacks, and did service of the highest order. At sight of a plane bearing the 1st Squadron's insignia, Hun soldiers became disorganized and unmanageable in their frantic haste to take cover.

During the entire Argonne offensive, the 1st Aero Squadron saw active service, without relief, with the 35th, 1st and 80th Divisions, and did special long-distance Army Corps observation from Oct. 6 to 24. On Oct. 5th the squadron moved to Julvecourt and remained there until the Armistice. In the Argonne, despite bad weather, the 1st Squadron made 237 flights, fought 65 combats, fired 25,000 rounds of ammunition and took 487 photographs.

In recognition of its splendid record, the 1st Squadron was made a part of the Air Service of the Army of Occupation and moved to Germany Dec. 5th, 1918. Other American aviators who were assigned to the squadron from March 13th to Nov. 3rd, 1918, were: Lieutenants K. F. Culbert, E. G. Wold, J. J. Sykes, W. B. Miller, D. Ker, W. B. Coward, H. W. Dahringer, J. F. Richards, A. F. Hanscom, R. F. Fox, W. A. Phillips, C. D. Johnson, H. S. Aldrich, J. F. McCormick, and C. H. Kennedy.

In July 1919, the squadron entrained at Weissentlurn, Germany, for Brest, France. It arrived at Hoboken on the *U. S. S. Pocahontas*, Aug. 1st, 1919. The 1st Squadron was the last to return home. But it remains first in rank as an observation squadron that fought its way to glorious victory!

END.

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Clubs

(*Continued from page 94*)

that article appeared. He sure had a popular idea and we are dead certain that all are in agreement on this subject. Mr. Owens promises to write some more on the plans in an early issue, so hold tight until the dope arrives.

Model Props

(*Continued from page 118*)

diameter of circle in center, on both blades. (6) This section is cut away. (7) Block is turned on narrow side. (8) At tips of blades, the thickness is 1/8-inch. (9) Divide and draw lines to same point as on flat side. (10) The block is then ready for carving.

Use a nut, bolt and washer, making the block fast to your work-bench or so that it will be firm and steady. One blade can now be pointed out so that it can be carved. Roughing-out is done with a draw-knife and rasp and, when it is finished, almost to the lines, the rest of the cutting is done by means of a sharp piece of glass, scraping with care so as not to cut beyond any lines.

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1"x1½"x15	52c

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1"	doz. 14c
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1½"	doz. 35c
3"	doz. 75c

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1¾"	doz. 15c

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½ pint	each 25c
1 pint	each 40c
1 quart	each 65c
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1 gal.	each $1.50

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Conversions

(*Continued from page 96*)

that he would be very happy to undertake this assignment if he had the capital to do so and there was adequate assurance it would not mean financial ruin. Remember, most manufacturers of low and medium-powered aircraft engines for commercial use have not shown profits up to now, and they remain in business because they either retain some vestige of their original enthusiasm and faith in the future of aviation, or they hope to recover some part of the investment represented in plant, machinery, tools, equipment, engineering development and unsold stocks of engines and parts.

Naturally, these manufacturers of engines in the low-powered range need help in the form of more business and, moreover, they need it very badly. One does not ponder over this important fact long before asking this rather pertinent question—Are the men directing the policies of the Bureau of Air Commerce too intent upon promoting their private notions of aircraft development at Government expense to observe the true condition of the industry, or can it be possible that they do not care especially what becomes of these organizations?

If there is an answer, it is important for the moment only in so far as it deals with the misleading publicity concerning automobile engine conversions which develops undue resistance to sales at a time when they are needed most. Eventually, of course, the conversion program will fade into oblivion if allowed to stand upon its true merit.

If the Bureau of Air Commerce elected to conduct an intelligent program which might lead to the development of a suitable, low-priced engine, it could be accomplished at no more expense by conducting a competition for designs. There really is no need for devoting space to an outline of even one of the various schemes which might be followed. The important thought to be conveyed is that all the skill and ingenuity possessed by our designing engineers would be brought into view through a competition of some kind. A substantial reward for the efforts expended is sufficient incentive to bring about these results.

We know that the low cost of automobile engines is the result of mass production, where the man-hours of labor have been reduced to a minimum. It is not without reason to assume that an aircraft engine should cost no more if produced in like numbers under similar conditions; in fact, it might cost even less. On account of its lower weight, the material cost might be reduced, since it is a well-known fact that, with labor costs at a minimum, any product is manufactured at so much per pound, depending upon the market price of the materials used.

Obviously, the market for aircraft engines holds no immediate promise of being large enough to adopt mass production methods. Until it does, no sensible engine manufacturer could undertake such an uncertain venture.

However, if the replies to the questionnaires on the mythical $700 airplane, together with the subsequent program of the Bureau of Air Commerce, are any indication that such a market exists or can be developed, then why not use the funds that are being spent on doubtful experimentation to underwrite an engine production program. This is the proper place to start, because the engine represents the major cost in the building of light airplanes. May we suggest that such efforts be centered upon the most promising design, or designs, among those submitted in the competition.

There is yet another possibility by which we may secure low engine cost through mass production, and that is to develop or discover an additional market. Hope is in sight with the advent of the rear-engine automobile, as I pointed out in POPULAR AVIATION of June, 1935. Rear-engine automobiles must have lightweight power plants in order to retain good weight distribution. It is not especially difficult to design a suitable engine for such cars with an eye toward incorporating a few simple changes later in order to make the engine adaptable to aircraft.

The outlay for tools can be absorbed by the large existing market for automobiles and, as a result, the selling price of the aircraft engine version should not exceed $2.00 per horsepower. At any rate, it should cost no more, and in all probability less, than an engine designed and produced in large quantities solely for the aircraft trade.

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Shredded...40, 5c	6x8 ..... 4c	1 oz. 5c
	12x16 .....15c	½ pt. 30c
Japanese Tissue	Clear Dope	Wood Veneer
All colors,	1 oz. 5c	20x30", 1 for. 9c
Doz. 16c	½ pt. 25c	2 for 17c

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1/32, 1/16, ⅛ .....3 ft. 1c	½" ....pr. 2c	¾" ....pair ...3c	½" ....pr. 2c
	⅝" ....pair ...3c	1" ....pair ...7c	¾" ....pr. 3c
	¾" ....pair ...4c	1¼" ....pair ... 9c	1" ....pr. 4c
	1" ....pair ...5c	1½" ....pair ...15c	1¼" ....pr. 6c
	1¼" ....pair ...8c		2" ....pr. 8c
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1¾" Diam...20c
3" Diam.....25c
DOWELS, 1/16x12, ...10c per doz.
SPOT WELDED HOLLOW ALUMINUM WHEELS
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1¾" .....pr. 11c
2½" .....pr. 14c
WASHERS, ¼ and ⅛ .....doz. 1c
SANDPAPER, package 5c
WIRE, 6 ft...3c 36" lengths.
ALUM. LEAF, 2 sheets for 1c
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Flying Flea

(*Continued from page* 98)

the last foot or so onto its wheels and runs five yards in the normal light wind.

Mr. Appleby says that the most difficult complex he had to overcome was his anxiety to correct each small yaw with the rudder by means of the lateral movement of the stick. He has found that the Pou will correct itself if left alone.

Secondly he found that it went against the grain to hold-off when landing with the seat of his overalls only six inches from the ground. Steep turns were easy.

Sir John Carden has formed a company called Carden Aero-Engines at Heston. That firm will deal with the production and sales of the motor for the new British Pou, of the Carden-Baynes Auxiliary retractable motor and of Pou parts and accessories.

The Carden-Ford motor is in production and will sell for $260.00, or with radiator and airscrew $300.00, plus dual ignition $350.00.

Abbott-Baynes Aircraft Ltd. are putting the complete Pou into production, and the price is $750.00 supplies as airframe and motor in separate components ready to bolt together. The airframe only is $450.00 packed and ready for assembly, and for an extra $75.00 one may have the complete Pou assembled and flight-tested by the works and supplied with a certificate of performance.

The production model for 1936 will have dual magneto ignition with an impulse starter, full instruments, and updraught carburetor to reduce the frontal area and a neat cowling over the top of the motor.

Incidentally, standard Ford spares are the replacements for this motor, including connecting rods, valves and so on. And the consumption is only .53 pints per b.h.p.-hour, which is about two gallons at full throttle. The tare weight of the whole skycraft is 380 lb. with an all up weight with pilot and fuel of 580 lb.

END.

Instrument Men

(*Continued from page* 94)

There is considerable need at all times for instrument men who have the necessary technical and practical training and the personal qualifications necessary for success in this highly specialized and increasingly important field.

Opportunities for advancement measure up well with those in other aeronautical fields. A number of Boeing School graduates who specialized in instruments are serving air lines as managers or assistant managers of instrument departments and as installation foremen.

Because of the highly specialized nature of this work and the unusual personal requirements the field of instruments promises indefinitely to offer good opportunities for employment and advancement.

END.

For MARCH

COVER SHOWS A FORMATION OF THREE VOUGHT SBU-1s

POPULAR AVIATION for the second month of 1936 will contain a great variety of excellent articles upon every phase of aviation. And in particular, will have information of service to our lightplane enthusiasts and gas-model constructors.

For the casual reader, having only an "arm-chair" interest in aviation, there will be a thrilling war story by Carl B. Ogilvie, an instructive article dealing with the opportunities offered by aviation to the young man, written by Harry A. White. Mr. White, with his years of experience in vocational training, views aviation education from an entirely new angle.

This is going to be a big year for lightplanes and gas-powered models. Both are going over in a big way and with a big bang. We have particularly useful material on both of these timely subjects, even to including the latest dope on the now popular "Sky Louse" or "Pou du Ciel." There will be descriptions of several new lightplanes that are now being produced for the market and which will prove of great interest.

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The World's Planes and Builders

(*Continued from page 99*)

MITSUBISHI KOKUKI (*Continued*)	Nakajima Fokker Monoplane.	American Fokker, "Universal" type, with accommodations for a crew of two and six passengers.
	Nakajima P-1 Mail-Carrier.	Modified Navy Type 90-11.
Tokyo Gasu Denki Kabushiki Kaisha (Tokyo Gas & Electrical Co., Ltd.), Ohmori, near Tokyo.	The "Chidori-Go".	3-4-seat light cabin biplane.
LATVIA		
Raab-Flugzeugbau Gesellschaft, Lacplesa Iela 13-2, Riga.	Grasmuecke II.	2-seat school or touring biplane.
	Tigerschwalbe II.	1-seat fighter.
	Tigerschwalbe III.	1-seat training biplane.
	Tigerschwalbe IV.	2-seat fighter or 2-seat training biplane.
	Anbo VI.	2-seat low-wing cantilever monoplane.
	Raab 25/34.	2-seat observation monoplane.
LITHUANIA		
The Lithuanian Army Aircraft Factory, Kaunas (Kovno).	Anbo IV.	2-seat military training monoplane.
NEW ZEALAND		
William S. Dini, 75, St. Albans St., Christchurch, N. Z.	Phoenix Monoplane.	1-seat lightplane.
NICARAGUA (None).		
NORWAY		
The Navy Aircraft Factory (Marinens Flyvebatfabrikk), Horten.	M.F.9 Single-Seat Fighter.	1-seat fighter seaplane.
	M.F.10 Advanced Training Biplane.	2-seat advanced training seaplane.
	M.F.11 Reconnaissance Seaplane.	3-seat reconnaissance seaplane.
PARAGUAY (None).		
PERU (None).		
POLAND		
E. Plage & T. Laskiewicz, Lublin.	Lublin R-XIII.	2-seat advanced training or observation monoplane.
	Lublin R-XIII bis.	Similar to R-XIII except that a float is fitted.
	Lublin R-XIV.	2-seat monoplane for advanced training or liaison.
	Lublin R-XVI.	Light commercial transport monoplane.
	Lublin R-XVIB.	Ambulance conversion of the R-XVI.
Podlaska Wytwórnia Samolotów S. A., Biala Podlaska.	P.W.S.6.	2-seat military biplane.
	P.W.S.10.	1-seat fighter.
	P.W.S. 11S.M.	1-seat advanced training plane.
	P.W.S 12S.P.	2-seat advanced training plane, convertible to 1-seater for acrobatic training.
	P.W.S. 19.	2-seat observation plane.
	P.W.S. 54T.	Commercial transport for three or four passengers.
Panstwowe Zaklady Lotnicze, Pulawska 2a, Warsaw.	P.Z.L. IV.	3-engine monoplane.
	P.Z.L. P-XI.	1-seat fighter monoplane.
	P Z.L. P-XXIV.	Similar to the P-XI but with a different type engine.
	P.Z.L. XXVI.	3-seat cabin monoplane.
Doswiadozalne Warsztaty Lotnicze (Aeronautical Experimental Works), Okecie Airport, Warsaw.	R.W.D.6.	2-seat cabin monoplane.
	R.W.D.8.	2-seat training monoplane.
	R.W.D.9.	Similar to the R.W.D.6.
	R.W.D.10.	1-seat training monoplane.
RUMANIA		
Societate Anonima Industria Aeronautica Romana, Str. Anastasie Simu No. 6.	I.A.R.14.	1-seat fighter used for training. Same as I.A.R.16 but fitted with Lorraine 12.Ebwater-cooled engine.
	I.A.R.15.	1-seat high-performance fighter monoplane.
	I.A.R.16.	1-seat fighter monoplane.
	I.A.R.22.	2-seat training monoplane.
	I A.R.23.	2-seat monoplane.
Fabrica DeAvioane S.E.T., Str. Popa Lazar 13-15, Bucharest.	S.E.T. X.	1-seat fighter training biplane.
	S.E.T. XV.	1-seat fighter biplane.
	S.E.T. 7.	2-seat advanced training biplane.
	S.E.T. 7K.	2-seat observation biplane.
	S.E.T. 10.	2-seat primary training biplane.
	S.E.T. 31.	2-seat advanced training biplane.
RUSSIA		
The Central Aero Hydrodynamics Inst., Vosnessenskaya 17, Moscow.	A.N.T. 9.	3-engine cabin monoplane.
	A.N.T. 14.	5-engine 36-passenger monoplane.

(*To be concluded in the March issue*)

China Clipper

(*Continued from page* 88)

cannot be bettered anywhere in the world. To fly the apparently endless waste—9,000 miles between the United States and China—is now as simple as flying an airliner today between Chicago and New York.

After several successful test flights out over the new route which were flown as far west as Guam, the Pan American Clipper returned to San Francisco to turn her work over to the recently completed Martin "miracle ship"—the China Clipper.

Today, the 25-ton China Clipper, after passing each of its flight tests, has flown the first round trip between America and the Philippines. Seasoned Pan American pilots have pronounced the ship an outstanding success. Although slower than the Sikorskys, the Martin clippers can carry a larger payload (more than 100 percent. of its own weight) and have a longer cruising range.

The China Clipper and its sister liners, soon to be delivered to Pan American (Philippine Clipper and Honolulu Clipper), are intended exclusively for trans-Pacific operations. They are elaborately furnished and outfitted to best suit the needs of an air passenger intending to spend the sixty hours' flying time between the trans-Pacific line's terminals aboard the flying clippers.

The China Clipper's first flight over the trans-Pacific airway just has been completed and the next step, the inaugural round trip between the United States and the Orient, is about to be inscribed in American aviation history. Literally at the flight controls of this immense project is Pan American Airway's ace pilot. Capt. Edwin C. Musick, veteran of more than 10,000 hours of flying unmarred by a single accident.

Much of this time, Musick has spent at the controls of Pan American ships. Quiet, gruff and decidedly unlike the hero-worshipping boy's vision of a great aviator, Capt. Musick has been flying since 1913.

His clean-cut face almost always wears the determined meticulous business-like expression that has stared at the horizons of many nations through the windows of pilots' cockpits. He is married, cusses a blue streak when the occasion demands, is respected and admired by his fellow Pan Americans and holds ten world aviation records—more than any other living pilot.

With the addition of the trans-Pacific divisions, Pan American Airways automatically becomes the largest and longest airline on earth today. Far surpassing Britain's Imperial Airways, the Netherlands' Royal Dutch Airlines (K. L. M.) or the Soviet Air Trust, Pan American's scheduled air line system now totals roughly 41,973 miles.

Capt. Musick and his seasoned fellow-pilots will soon start actual flight operations over the new ocean route. When the Philippine Clipper and Honolulu Clipper are delivered, they will go into service immediately on the trans-Pacific line.

At first, just mail will be carried. Later, when the last iota of vital information is gleaned from the experimental and mail flights, Pan American will start accepting the many reservations they already have in their files from prospective passengers.

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END.

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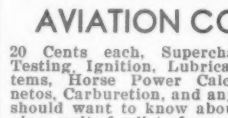

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Soaring

(*Continued from page* 112)

at the same altitude as that of my take-off point. Thus, being assured that there were many fine thermals over the valley, and the fact that the "Briegleb Utility" had such a fine gliding angle, I turned toward the west and started out for the town of Yuciapa, California.

I noticed some smoke in the distance was blowing in a northeasterly direction and so, from all indications, the wind would be striking the broadside of a long ridge running east and west. I thought that, if I could fly back to this ridge and still have sufficient altitude to get over it, I could soar for fifty miles or more. Half way back to this bluff, I realized I could not make it and so once more turned toward Yuciapa, where I landed after being in the air for 37-minutes and setting a new California distance record of 14-miles.

We have the permission of Mr. Ford to make use of this mountain for a soaring camp and so by the time the next issue of POPULAR AVIATION hits the stands, we will have plenty to tell you.

Classified

PHOTOGRAPHS—Aviators, Planes, Celebrities, Scenic. All sizes. Sample and price list, 10c.—Ralston Photos, 612 No. Denny, Indianapolis, Ind.

PHOTOGRAPHS of British and European Air Liners. Post card size 20c each, $1 per ⅓ doz., $1.50 per doz.—Line 35, Ridgemount Ave., Coulsdon, Surrey, Eng.

BUILD your own Midget Race Car or Lightplane from Storms Plans. Engines, air propellers, hubs, 20x4 tires, wheels, etc., at low prices. Circulars, 10c.—STORMS AVIATION CO., 13 Southside Ave., Asheville, N. C.

BALSA WOOD—½ price. 100 cubic inches of any sizes, 25c. State sizes wanted.—Supplies Department, Kahn Aircraft Company, 5710 Woodlawn Avenue, Chicago.

ARMY-NAVY gives free Radio Operators' training for service on aircraft, ships. Salary, expenses paid. Information pamphlet, How to Apply, 20c.—Continental, Box 344, Dept. 11, Indianapolis, Ind.

USED AIRPLANES $50.00 AND UP—Literature, 10c.—Continental Sales, Box 344, Dept. 11, Indianapolis, Ind.

CANADIANS—Motors, Parts, and material for The Flying Flea and other light planes. Send dime for list.—Hoyt's Aviation Supplies, Orillia, Ontario.

MODEL BUILDERS!—New 9-ft. soaring glider. Blueprints, Complete set, only $0.50.—Peyton Autry, Boonville, Indiana.

WANTED—Work on any airport, 6 months actual training, age 23, clean, careful, ambitious. Salary not particular.—Please write R. O. Williams, Pittsford, Mich.

"SALE OF HEATH LITERATURE.—If you are interested in lightplanes, seaplanes, ice and snow sleds, Heath motors, models and propellers, be sure to send your 25c for our special offer of ten large folders describing these Heath products and designs.—Heath Aviation Company, Dowagiac, Michigan, Dept. P-1."

YOU CAN'T BEAT THIS: Rigid course in practical aviation $498, and an airplane FREE. The same plane, new, low wing, two place, monoplane, fly it off our field, $698. Our propellers can't be beat for quality and price.—Standard Aircraft Co. of Texas. Box Fourteen, Harwood.

CHURCH (Chicago)—Four cylinder lightplane engine wanted for cash. Must be complete and in good condition.—H. W. Nieman, 1716 N. 40th St., Milwaukee.

USED PLANES—Motors, crackups, parachutes. OX planes $75 up. Terms, trades, instruction. Complete Directory 20c, postpaid, giving owner's price, name and address.—Used Aircraft Directory, Athens, Ohio.

AT LAST you can own a car for racing or sport use. Mine cost me one dollar. It's new in design and construction. It's a beauty on wheels. Be popular! Send five cents for illustrated information. You won't be sorry. Let me prove my statements.—Leonard Erbert, Ellis, Kansas.

Barter and Exchange

Notices in these columns are confined to trades. Cash sale advertising must be inserted under the Directory or Classified columns. Notices in the Barter and Exchange columns, three cents per word.

WANTED — Gasoline model motor. — Russell Tracy, Pitman, New Jersey.

WANTED—Small Air Wheels. Model A Prop. 30-60 H.P. Motor, Cirus Motor OX5 Ship. Have OX5 Heath Parasol, Model A Ship, Peltenpol Steel tube fuselage. Model A Roadster. Cash.—Dale Walter, Box 184, Severy, Kans.

FLYING FLEA is what I'm building. Can use a motor and whatever you have for this ship. Have typewriter, guitar and course, Hinton's course, others, cash.—Joe Michon, New Hampton, N. Y.

WANTED—Used aircooled motor 35-60 H.P. State condition and price in first letter. Will pay cash or trade.—R. Bittner, 2247 So. Irving Ave., Chicago, Ill.

WANTED—Lightplane engine. Will trade 2 cyl. Johnson motorwheel, new last spring.—Norman Laurence, 623 Morrison St., Fremont, Ohio.

SWAP—.22 revolver for complete model gas engine.—Herbert Boen, Waden, Minnesota.

FOR SALE OR EXCHANGE—New lightplane propellers in trade for lightplane motors, tubing or what have you.—Address Standard Aircraft Co., Box 14, Harwood, Texas.

20x4 WHEELS complete, round and streamline tubing, aircraft machinery. Prefer cash or 1/3 H.P. electric motors, what have you?—McCoy's Aircraft Service, Napoleon, Ohio.

FORTY DOLLARS or what have you? Takes 30 H.P. two cyl. opposed, airplane engine complete with metal tipped prop.—R. McKinnon, Calumet, Mich.

HEATH motor, propeller and hub. Good condition. Trade or cash, $50.00.—Ernest Hantalo, Soudon, Minn.

1931 Indian Chief Motorcycle, A-1 condition, motor rebuilt, new tires, lights, battery, carburetor, paint job, $125.00. Mead Rhon Ranger primary glider, A-1 condition, $85.00. Set of Lincoln Sport Plane blueprints, $4.00.—Ray Martin, Route 1, Sterling, Ohio.

HAVE Electric Drill, Gas Engines, Aviation Mags., Target Pistol, Spraying Outfit, Model Engine, Big List. Want metal lathe, drafting set or typewriter or?—Alex Kruczek, 407 East, Buffalo, N. Y.

SWAP AVIATION Short Courses for the names of three of your friends that are interested in aviation.—Box 30, Schertz, Tex.

EXCELLENT field, hangar and shop, students waiting, prospects good. Use of field free in exchange for flight training. Correspond at once.—George King, 102 Magnolia Drive, San Antonio, Texas.

HAVE 60 volume Aviation Course, complete overhead valve-downdraft carburetor head for "T" Ford racer, and cash. WANT drill press, band saw, flexible shaft, and motors.—P. Shipps, So. River Rd., Zanesville, Ohio.

"SWAP—Sport Goods for air rifle."—E. Kent, 143 Peter St., Buffalo, N. Y.

AIRPLANE Photographs for Sale or Trade—Many good rare photos.—R. Perrault, Lyndonville, Vermont.

NEW, unused Alco monoplane fuselage, blueprints, spars and wheels. Trade for good camera, typewriter, clarinet or photographic equipment. Also have new, "Airplane Structures," Niles & Newell.—Dale DeMoss, Route 1, Thornton, W. Va.

WANTED—Used Szekely complete. Prefer S-3-35 or 45 H.P. State condition, price first letter.—J. W. Brewer, Elms, Kans.

AIRCRAFT SPRUCE (all sizes—both A. N. and clear commercial grades) to trade for anything in the airplane line. Get my list, Rock-bottom prices! Best deal in America! Cash, or send full description of what you have to trade, prices expected, etc.—Earles, Hayes, So. Dakota.

SEND for free sales-sheet (number 1-A) showing hundreds of bargains in airplanes, motors, parts, propellers, materials, lightplane kits and blueprints. Cash, terms, and trades. Interests all.—Earles, Hayes, South Dakota.

WANTED—An "Air Camper" less motor. Need not be covered. Will pay freight charges and will answer all letters.—R. M. Lesher, R. F. D. No. 1, Lees Summit, Missouri.

SALE OR TRADE—Licensed Secondary Soaring Glider.—Intercourse Glider Club, Intercourse, Penna.

WANTED—OXx6. Have Harley Single Motors.—H. Tice, 13718 Eaglesmere, Cleveland, Ohio.

FAIRCHILD GYPSY 22, new in February, perfect condition, privately owned, not a scratch. 82 hours' total time, red fuselage, silver wings, sell for cash, $2375, or trade for Fairchild 24.—G. D. Beyer, Bridgeport, Nebr.

HEATH V, less motor, trade for car or cash. Two Heath-Henderson props. Winfield carburetor 1⅝ in., tachometer with cable, for sale. Want Miller overhead for OX5.—Box 163, Seneca, Nebr.

WACO 10—OX5 eligible for license. Will trade on used or new truck or car.—Harold L. Cox, No. 2, Waterville, Kans.

MONOPREP now flying, motor had a major. What am I offered?—Jack Remsen, 78 Parkhurst St., Newark, N. J.

OX LINCOLN PAGE converted into monoplane by skilled workmanship. In fine condition, now flying. Always hangared. Twenty hours' time since conversion. Identified. Cost $375 less labor. Will trade for good boat, house car or $175. Send dime for photos.—Glenn W. Berk, 54 S. Lane St., Blissfield, Mich.

370 H.P. MARINE LIBERTY. Capital Conversion. Run 30 hours. Value $550. Will sell or trade for late model car.—Marvin Fiddleman, 322 W. 72nd St., New York, N. Y.

Gas Fans

(*Continued from page* 120)

couple of work hours in the shop with my two boys, or in the 'airplane factory' as they call it.

"To show them that enthusiasm is the Mother of Creation, I built the 7-foot gas model (shown here) that took off a few times. This was something that thrilled me more than anything else, because my younger boy just got a second prize cup at a gasoline model contest held at Paoli, a main line airport. He thinks that I would have taken first place, but unfortunately I didn't even have mine started. Here is the picture of my first gasoline model."

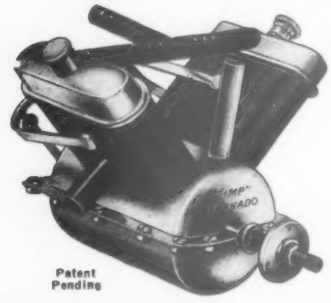
This is certainly fine. We wish that some of the other boys would call this to the attention of their fathers. Maybe we might be able to institute a Fathers' Gas Model Meet. Who knows?

* * *

JAMES DIXON, 783 West 49th St., Norfolk, Va., sends us a picture of his gas powered job which is of his own design. It sure is a nice clean-cut looking monoplane that should go places.

The wing span is 7 feet with a chord of 12 inches. The body length is 49 inches. A little Loutrel engine sits in the nose that swings a 17-inch prop at about 4,000 r.p.m. Our best wishes to you, Mr. Dixon, for a successful test-hop and many subsequent long distance flights.

END.



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Model V-4 (shown above) four cylinder. Weight only 3½ oz. Will fly models from 4 to 8 feet. Complete with Generator, Feed Line and Safety Clip..... $7.50

Model S-2, two cylinder. Weighs 2½ oz. Flies models 3 to 6 feet. Complete with Generator, Feed Line and Safety Clip..... $5.00

(If ordered by mail, add 25c for postage)

Send for Free Circular right now and find out about these Motors.

INTERNATIONAL MODELS COMPANY

1785 Broadway, General Motors Bldg., New York.

Instructors

(*Continued from page* 110)

transferred into the engineering department. Two years after entering the Travel Air factory he became chief engineer.

While chief engineer for the Travel Air Company, Rawdon developed the famous Travel Air Mystery plane, the first of the fast low-wing racers. In 1929, when the plane was introduced to the world, it flew off with every race in the country, establishing the then astonishing top speed of 230 m.p.h. Rawdon will be the third member of the staff of the engineering school which is headed by Carleton Stryker, former engineer for Northrop, Vultee and Douglas.

Grace was added to the staff of the Institute to maintain the early lead that had been established by the school in its development of a metal department. After an exhaustive search for a competent man to carry on the work of developing a metal department based on modern factory methods of metal fabrication, the school's problem was solved by George Stromple, factory manager for Douglas Aircraft at Santa Monica. Stromple recommended Grace, who at the time was working in the factory, for the position.

For a period of over ten years, Grace had been with Douglas. He started to work for the company shortly before the Army "Around the World" flyers turned the eyes of the world to the Douglas plane and he left Douglas for Curtiss-Wright Tech shortly after the MacRobertson race from London to Melbourne, when the eyes of the world were again focused on the performance of a Douglas built plane.

Although Grace had experience in a number of the departments of the factory, the majority of his time at Douglas was spent in the experimental department. His specialties were in welding and in the fabrication of metal fittings and parts. It is in the experimental department that all new designs take form in the construction of the first full sized model.

END.

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Gas Model Contests

(*Continued from page* 119)

The Bamberger Aero Club, of which the members now hold all official gas model records, is expected to be a strong contender for the 1936 National Trophy. With Kovel and Bassett now in the open class it is hard to predict who will win the meet.

However, with Bamberger's presenting Weiss, Greenberg, Raddoff, most likely in the field of competition, and along with them that consistent winner and model wizard, Frank Ehling who is now considered one of the most expert of gas model builders, it would not surprise Bamberger members if one of this club again walked away with the trophy.

The best and most popular of the many types of gas models, tried by Jersey Model Builders, seems to be a high-wing cabin model with a span of about eight feet and weighing in the neighborhood of five pounds.

The author has found that most of the motor trouble is due to poor batteries or loose unsoldered wires. The gas model builder would do well to buy a small ammeter or voltmeter and test his batteries before risking one of his very precious official flights only to see his motor cut out during the flight.

I have found that an old flashlight case with binding posts soldered to front and rear caps makes a very good battery container. No soldered wires are needed nor is there any chance of the batteries jarring loose.

All surfaces should be fastened securely and the use of thin wire for the purpose of adjusting should be avoided as the wire is very apt to crystalize and break. Herbert Greenberg had the thrill, if it could be called such, of seeing his model crash from an altitude of 500 feet when the wire holding his rudder crystallized. The gas model should have too much, rather than too little, dihedral and a wing with upturned tips appears to be best for all around stability.

The motor is best mounted on the lower longeron—not the upper as is generally stated—as it is best to keep the center of gravity and weight low, thus giving a fast flat glide instead of a stalling type which loses all of the advantages found in thermal currents.

END.

ARE YOU INVENTIVE

INVENTORS: Send immediately for your copy of our big, new **Free book, "Patent Protection."** Forty-eight pages of interesting facts. Tells how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; shows interesting inventions; illustrates important mechanical movements. **Other men have read and profited by this book.** With book we also send **Free Evidence of Invention form,** that you can use to establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our book are worth money to the man with a good invention. Address: **Victor J. Evans & Co., Registered Patent Attorneys, 727-B Victor Building, Washington, D. C.**

BUFFALO PUBLIC LIBRARY DEPARTMENT OF TECHNOLOGY

Airy Chat

(*Continued from page 84*)

ALL HAIL the China Clipper of the Pan Am. She flew her course from California to Hawaii and return as on grooved rails by the magical assistance of radio. It was only a few years ago that the same route was the scene of a dire tragedy during the Dole Trophy contest at a time when radio beacons were unknown and when avigation was in a crude state. Sometimes we wonder to whom the credit for this flight is due, to the plane, the engines, the pilot or the radio!

* * *

AT last, the Winnie Mae has become a museum piece. She has sure earned her rest. Twice around the world and almost numberless miles on shorter cruises, she served her master well.

* * *

WHILE national radio hook-ups announce the promotion of a Will Rogers memorial, there is little apparent effort toward erecting a memorial to Wiley Post, that intrepid pilot.

It seems only right and fair that we should endeavor to perpetuate the memory of this great aviation personality, a man of exceptional ability, with an iron will and nerve and a thoroughly modest man under all conditions. Undaunted by physical handicaps, Wiley Post attempted and successfully completed the most grueling and arduous flights known to modern aviation.

We only hope that leaders in the aeronautic industry will take the task in hand for erecting a suitable memorial to the esteem in which aviation held him. Wiley Post and the Winnie Mae, co-partners in the greatest of aviation records, will go down in history as All-American monuments of achievement.

* * *

GAS-MODEL flying continues to develop with tremendous rapidity. And the faster it develops, the less expensive it will become because volume production will gradually reduce the cost of that most expensive element—the miniature gasoline engine. Already, the prices of the little engines have descended very materially, because of the new interest in gas-model flying, and even the most humble pocket-book can now afford to enter this greatest of outdoor sports.

It is getting so that it is difficult to tell where a gas-model becomes a flying Louse, or where a Flying Louse becomes a gas-model, there is such a small difference in the dimensions of the larger gas-models and the Pou du Ciel. For example, a small Pou has a wingspan of about 16 feet while a large model may have a span as great as 12 feet. Only four feet difference between the extremes.

* * *

JUST a word with our inventors. We like to hear of your ideas, particularly if you have done enough experimental work to have practical data on the subject, but it is manifestly impossible for us to take upon ourselves the duties of engineers to work out devices that may be submitted to us. We would be glad to do this, if time permitted, but it is about all that we can do to find time to get out P. A.

We have no way of finding out whether an idea is patentable or not unless we have definitely seen something like your idea. The only way of actually telling whether you have anything original is to apply for a patent—and then maybe you'll get a big surprise even after your patent is granted.

The writer has had claims cancelled or knocked out even after his patent was granted and when he held the papers in his own hands. Someone may come along and claim that he invented the device before you took out your patent and, if he can convince the commissioners that he is right, well, you're just out of luck.

* * *

Well, so long, fellows. We will see you here in a month to the dot.

J. B. R.

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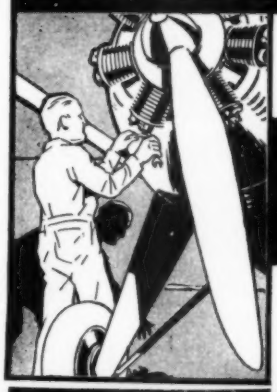

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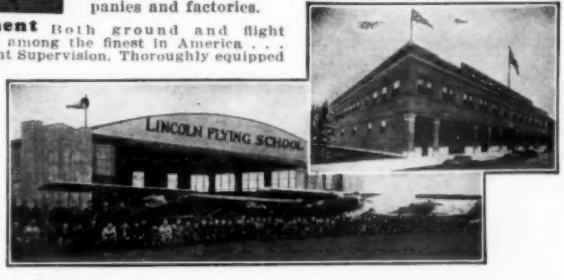

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